AMPHIPOD NEWSLETTER

10

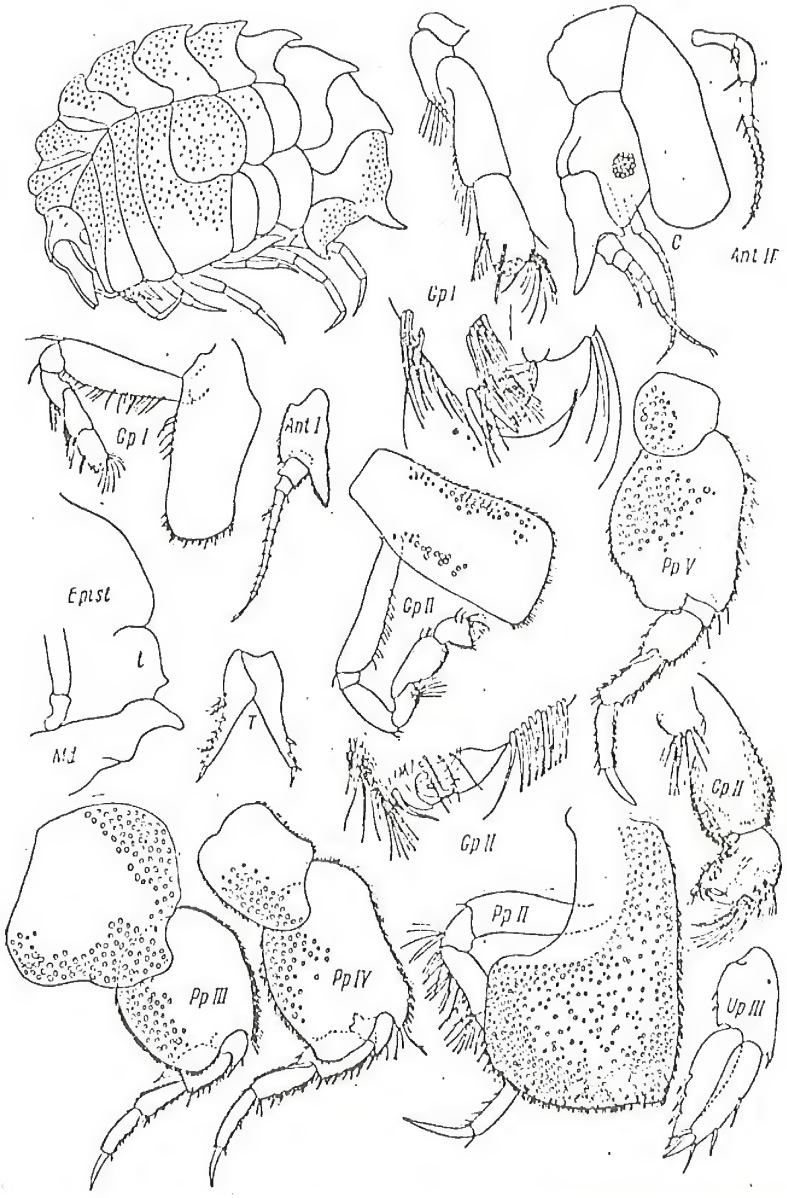

Рис. 108. *Lepidepecreum comatum* Gurjanova sp. n. Восточное побережье о. Итуруп, ♂.

EDITED BY: Wim Vader, Tromsø Museum
PRODUCED BY: Les Watling, University of Maine

AMPHIPOD NEWSLETTER 10

September 1978

I wrote in the introduction to A.N. 9, that that issue was "a few months delayed". This has unfortunately proved to be a considerable understatement. Problems with ZooTax which I had not the energy to overcome as quickly as I should have, produced the trouble, and we must be very grateful to Les Watling for getting the Newsletter afloat again. Fortunately, I had already collected a number of contributions for A.N. 10, so we hope to have this in your hands before Christmas, even for those who have to wait longest for their surface mail.

I must apologize for two curious mistakes in A.N. 9. The piece on amphipod collections in the Hamburg Museum was written by Hans-Georg Andres, and Drs. Williams, Wolff and Yoo were inadvertently omitted from the list of subscribers.

I have solicited several abstracts of unpublished theses on amphipods for this newsletter, while Marion van Naren has contributed a bibliography on amphipods and Acanthocephala. Please let me know what you think of this type of contribution.

Deadline for A.N. 11 will be 15 January. In it it would be nice to have an index of the new amphipod genera (at least) mentioned in the bibliographies of A.N. 1-10. Any volunteers?

Cover: Taken from Gurjanova (1962), Bokoplavy severnoi chasti Taxogo Okeana (Amphipoda-Gammaridea). If anyone has an illustration, humorous or techical, that they would like to see on a future cover, please feel free to send it to Wim Vader or Les Watling. It must, however, fit on the cover without reduction.

Subscriptions: Please send the equivalent of US $3.00 to your regional collector (or more if you can) in the next month or so to cover the projected expenses of A.N. 11 and 12. Those of you outside the U.S. will receive your A.N.'s by air, thus the increase in cost. Also, the mailing list has been computerized, and the mailing of the A.N. should occur much more rapidly with A.N. 11.

Bibliography on Amphipoda as intermediate hosts for helminth parasites.

Marion van Maren

Awachie, J.B.E., 1966. Observations on Cyathocephalus truncatus Pallas, 1781 (Cestoda: Spathebothriidae) in its intermediate and definitive host in a trout stream, North Wales. J. Helminth. 40: 1-10. (Gammarus pulex)

_____, 1967. Experimental studies on some host-parasite relationships of Acanthocephala. Co-invasion of Gammarus pulex L. by Echinorhynchus truttae Schrank, 1782 and Polymorphus minutus (Goeze, 1782). Acta parasit. pol. 15: 69-74.

Barrett, J. & P.E. Butterworth, 1968. The carotenoids of Polymorphus minutus (Acanthocephala) and its intermediate host Gammarus pulex. Comp. Bioch. Physiol. 27: 575-581.

Baylis, H.A., 1931. Gammarus pulex L. as an intermediate host for trout parasites. Ann. Mag. nat. Hist. 7: 431-435.

Bertocchi, D. & G. Francalanci, 1963. Grave infestazione da Echinorhynchus truttae Schrank in trote iridee di allevamento (Salmo gairdneri). Veterinar. Italian. 14(5): 475-481. (Gammarus pulex)

Bethel, W.M. & J.C. Holmes, 1973. Altered evasive behavior and responses to light in amphipods harboring acanthocephalan cystacanths. J. Parasit. 59: 945-956. (Gammarus lacustris, Hyalella azteca)

_____ & _____, 1974. Correlation of development of altered behavior in Gammarus lacustris (Amph.) harboring cystacanths of Polymorphus paradoxus (Acanthocephala) with infectivity of the definitive host. J. Parasit. 60(2): 272-274.

_____, 1977. Increased vulnerability of amphipods to predation owing to altered behavior induced by larval acanthocephalans. Can. J. Zool. 55(1): 110-115. (Gammarus lacustris, Hyalella azteca)

Brownell, W.N., 1970. Comparison of Mysis relicta and Pontoporeia affinis as possible intermediate hosts for the acanthocephalan Echinorhynchus salmonis. J. Fish. Res. Board Can. 27: 1864-1866.

Butterworth, P.E., 1969. The development of the bodywall of Polymorphus minutus (Acanthocephala) in the intermediate host Gammarus pulex. Parasitology 59: 373-388.

Buttner, A. & C. Vacher, 1960. Evolution d'un Plagiorchis s'enkystant chez Gammarus pulex L. et identifié à Plagiorchis cirratus (Rud., 1802) (Trematoda, Plagiorchiidae). C.R. Soc. Biol. 153-196: 1712-1718.

Crompton, D.W.T., 1967. Studies on the haemocytic reaction of Gammarus spp. and its relationship to Polymorphus minutus (Acanthocephala). Parasitology 57: 389-401. (Gammarus pulex, G. duebeni).

_____, 1964. The envelope surrounding Polymorphus minutus (Goeze, 1782) during its development in the intermediate host, Gammarus pulex. Parasitology. 54: 721-735.

Degiusti, D., 1939. Partial development of Echinorhynchus coregoni in Hyalella azteca and the cellular reaction of the amphipod to the parasite. J. Parasit. 35 (Suppl.): 31.

_____, 1962. Ecological and life historical notes on the trematode Allocreadium lobbatum (Wallin, 1909) and its occurrence as a progenetic form in amphipods. J. Parasit. 48(2): 24.

Degiusti, D.L. & J. Budd, 1959. A three year survey of the infection rate of Echinorhynchus coregoni and Cyathocephalus truncatus in their intermediate host Pontoporeia affinis from South Mouth, Ontario. J. Parasit. 45:

Denny, M., 1969. Life cycles of helminth parasites using Gammarus lacustris as an intermediate host in Canadian lake. Parasitology 59: 795-827.

Dolfuss, R.Ph., 1938. Cycle évolutif d'un trematode du genre Coitacoecum W. Nicoll. Progénèse de la larve metacercaire chez amphipodes. C.R. seanc. Ac. Sci. 209,

Dorier, A., 1931. Infection des Truites arc-en-ciel d' elevage par les Echinorhynques. Trav. Lab. Hydrobiol. Piscicult. Univ. Grenoble 23: 55-60.

Grimm., 1872. Uber das Vorkommen des Echinorhynchus polymorphus in Flusskrebs. Nachrichten der G.A. Universität und der K. Gesell. der Wiss. zu Göttingen: 246-248.

Henninger, G., 1905. Uber eine Erkranking von Macropoden durch Futterung mit Flohkrebsen (Gammarus). Natur und Haus 13:

Hine, P.M., 1977. Acanthocephalus galaxiae n. sp. parasitic in Galaxias maculatus (Jenyns, 1842) in the Waimeha stream, New Zealand. J. roy. Soc. N.Z. 7: 51-57 (Paracalliope fluviatilis)

Hine, P.M. & C.R. Kennedy, 1974. Observations on the distribution, specificity, and pathogenity of the acanthocephalan Pomphorhynchus laevis (Müller). J. Fish Biol.: 521-535. (Gammarus pulex)

_____, 1974. The populations biology of the acanthocephalan Pomphorhynchus laevis (Müller) in the river Avon. J. Fish Biol. 6: 665-679 (Gammarus pulex)

Hindsbo, O., 1972. Effects of Polymorphus minutus (Acanthocephala) on the colour and behaviour of Gammarus lacustris. Nature 283: 333.

Holmes, J.C. & W.M. Bethel, 1972. Modification of intermediate host behavior by parasites. Zool. J. Linn. Soc. 51 (Suppl.): 123-149. (Gammarus lacustris)

Hynes, H.B.N. & W.L. Nicholas, 1957. The development of Polymorphus minutus (Goeze, 1782) (Acanthocephala) in the intermediate host. Ann. Trop. Med. Parasit. 51: 380-391. (Gammarus)

_____, 1958. The resistance of Gammarus spp. to infection by Polymorphus minutus (Goeze, 1758) (Acanthocephala). Ann. Trop. Med. Parasit. 52: 376-385. (Gammarus lacustris, G. duebeni, G. pulex)

Iaczo, T., 1943. Polymorphus minutus (Goeze) larva in Carinogammarus roeseli. Hungary Arb. Ungarn. Biol. Forsch. Inst. 15: 128-131.

Joyeux, C., 1926. Sur quelques cysticercoides de Gammarus pulex (L.) Archiv. für Schiffs.- und Tropenhygiene 30: 433-451.

Klekoski, R.Z & A. Guttowa, 1968. Respiration of Eudiaptomus gracilis infected with Diphyllobothrium latum. Exp. Parasit. 22: 279-287.

Le Roux, M.L., 1933. Parasitisme et caractères sexuels secondaires chez Gammarus pulex L, Bull. biol. France Belg. 16(Suppl.): 1-138.

Luther, A., 1904. Larver af Echinorhynchus polymorphus i Gammarus locusta. Meddn. Soc. Fauna Flora fenn. 31:

Noll, W., 1950. Eine Masseninfektion von Gammarus pulex fossarum Koch mit Polymorphus minutus. Nachr. Sammelst. Schmarotz. Aschoffenburg. 27: 13-15.

Nybelin, O., 1924. Zur postembryonalen Entwicklungsgeschichte der Acanthocephalen. I. Zool. Anz. 58: 32-36. (Amphitoe rubricata, Calliopus rathkei, Gammarus locusta)

_____, 1924. Zur postembryonalen Entwicklungsgeschichte der Acanthocephalen. II. Zool. Anz. 61: 190-193. (Pontoporeia affinis)

Podesta, R.B. & J.C. Holmes, 1970. The life cyles of three polymorphids (Acanthocephala) occurring as juveniles in Hyalella azteca (Amphipoda) at Cooking Lake, Alberta. J. Parasit. 56: 1118-1123.

Rumpus, A.E., 1973. The ecology of the parasites of Gamarus pulex in the River Avon, Hampshire. Ph.D. Thesis, University of Exeter.

Rumpus, A.E. & C.R. Kennedy, 1974. The effect of the acanthocephalan Pomphorhynchus laevis upon the respiration of its intermediate host Gammarus pulex L.. Parasitology 68: 271-284.

Sandeman, I.M., 1962. Diplocotyle, an occurrence of gravid worms in Gammarus. Parasitology 52:

Scheer, D., 1935. Die Jugendform der Echinorhynchus truttae Schank und ihr Vorkommen in Gammarus pulex. Z. Parasitk. 7:440-442.

_____, 1935. Gammarus pulex und Carinogammarus roeseli als Zwischenwirte von Polymorphus minutus. Z. Parasit K. 7: 268-272.

Schmidt, G.D., 1964. Anote on the Acanthocephala parasitizing amphipod Crustacea in a springfed pond in Montana. Can. J. Zool. 42 (Gammarus limnaeus)

Scott, K.J., 1974. Psammonyx nobilis (Amphipoda, Lysianassidae), a new host for Bothrimonus sturionis (Cestoda, Pseudophyllidae). Proc. Helminth. Soc. Washington 41: 256-257.

Spaeth, F.W., 1951. The influence of acanthocephalan parasites and radium emanations on the sexual characters of Hyalella (Crustacea, Amphipoda). J. Morph. 88: 361-382.

Spencer, L.T., 1974. Parasitism of Gammarus lacustris (Crust., Amph.) by Polymorphus minutus (Acanth.) in Colorado. Am. Midl. Nat. 91: 505-509.

Stark, G.T.C., 1965. Diplocotyle (Eucestoda), a parasite of Gammarus zaddachi in the estuary of the Yorkshire Esh, Britain. Parasitology 55: 415-420.

Sudarikov, V.E. & Y.V. Kurochkin, 1964. The findings of larvae of the sturgeon cestode, Bothrimonus fallax Lǿhe, 1900, in amphipods in the Caspian Sea. Tr. Astrakhan. Gos. Zapovedn. 9: 214-218 (in Russian)

Uspenskaya, A.V., 1960. Parasitofaune des Crustaçes benthiques de la Mer de Barents (Exposę preliminaire). Ann. Parasitol. Hum. Comp. 35: 221-242. (Gammarus locusta, Amphitoe rubricata)

Wisniewski, L.W., 1932. Cyathocephalus truncatus Pallas. I. Die Postembryonalentwicklung und Biologie. Bull. int. Acad. Cracovie 2 (B): 237-252.

_____, 1933. Uber zwei neue progenetische Trematoden aus den Balkanischen Gammariden. Bull. inter. Acad. Polon. Sci. Lettr. Ser. B, 11:

ABSTRACTS OF UNPUBLISHED THESES

In A.N. 9 the so-called "abstract" of Michael Besner's thesis was in reality just a list of contents. The real abstract of the major paper is given below.

Michael Besner (see A.N. 9 p. 16.W.V.)

ABSTRACT

Annual ecological structure of gammaridean amphipod associations in the hyperbenthos and endobenthos of a shelf mud bottom in the Lower St. Lawrence Estuary in 1970 and 1971.

Mean absolute densities and relative frequencies of 81 gammaridean species are compared on a yearly basis and clustered into 6 categories of importance in the association, using 177 day and night samples from a Macer-GIROQ hyperbenthic sled (standard nets at 2 levels, 10-46 and 106-142 cm from the sea-bed, 28400 m^3 of water filtered on .5-mm meshes), and 47 anchored dredge samples (33.5 m^2x6 cm of mud sieved on 1-mm meshes), at the same monitoring station occupied from June to October in 1970 and 1971. The environment was very uniform: flat ground, 120 m depth, temp. 1-3.4°C, sal. 32-33‰.

The Eusiridae Rhachotropis oculata (23-49% of individuals), Oedicerotidae (13-24%) and Lysianassidae (13-14%) dominated the 75 species caught at the 2 hyperbenthic levels in 1970 (3.07indiv./m^3) and in 1971 (1.23 indiv./m^3) The Lilljeborgiidae Idunella aequicornis (59% of individuals) and Ampeliscidae (Haploops tubicola dominant) were predominant among the 31 species caught in the endobenthos in 1970 (23.3 indiv./m^3) and in 1971 (40.7 indiv./m^3). The close relation between the frequency and log density of each species in either year suggests a homogeneous hyperbenthic association at both levels, but diluted on top, and contagious distributions for some species, which may be interpreted.

Total hyperbenthic density in the upper net was 7 times lower than in the lower net in 1970, and 15 times in 1971; deprived of R. oculata, whose density was stable from 1970 to 1971, and transformed into indiv./m^2, it decreased geometrically (23.33: 1.17: .04) from the endobenthos to the upper net level in 1970, but not in 1971 (40.59: .31: .01). The higher hyperbenthic diversity in 1970 was more nearly the same in both nets than in 1971, and lower at night and in the upper net. Weaker vertical migrations in 1971 are inferred, less involving hyperbenthic species, which depend less on the seafloor, than epi- and endobenthic ones, whose mean density in the dredge tended to vary from that of the lower net, if species were compared.

In 49 species, ranked on a gradient of swimming activity through ratios between their frequencies at the 3 levels, absence from the dredge generally goes with high hyperbenthic ratios, and vice versa. These results agree well with the known autecology of the species, reviewed here, but Oedicerotidae and Lysianassidae therein appear better swimmers than burrowers, probably because of their agility to escape from the dredge. Genera of the same family often have quantifiable ecological kinships which allow an ecological grouping of families.

Compared with a mud association at the same depth in Baie des Chaleurs (Gulf of St. Lawrence), that of the Estuary has only 45% in common with the other, (a) includes fewer Oedicerotidae, (b) more (16%) bathyal and stenothermic (2-5°C) species which are absent (1-2%) from the colder water of the Bay, and fewer (24%) arctic species than that of the Bay (37-40%), and (c) does not swim so far away from the sea-bed. These differences would be due, in the Estuary community, (a) to a poorer clay content in the mud, (b) to its slightly warmer (by .5-1.5°C) waters, which are closer to the continental slope of the Laurentian Channel, and (c) to its less transparent water at the surface.

ABSTRACT OF THE DISSERTATION

Orientation Behavior in Beachhoppers of the Genus Orchestoidea: Capacities and Strategies

Robert Frank Hartwick, Doctor of Philosophy, in Biological Oceanography
University of California, San Diego, 1975.
Professor James T. Enright, Chairman.

The special stresses of life in the intertidal zone have induced an array of complex adaptations among the inhabitant species of the shoreline. In freely motile animals, a means of guiding their locomotion on a compass bearing toward their preferred habitat from the landward or seaward extremes of the zone is, apparently, a behavioral adaptation of some importance. Talitrid amphipods, the common "beachhoppers" which dwell in sandy beaches near the high tide strandline, have been shown to possess several orientation responses which may serve the purpose. Because each response has basic limitations in reliability, it may be that different information sources are relied upon, in turn or in chorus, to optimize the orientation strategy.

In this study, talitrids of the genus Orchestoidea were tested in both field and open-air laboratory experiments to reveal details of their orientation capacities and strategies. In a rooftop sun-orientation chamber, designed for replicate releases of individual amphipods, it was shown that at least 90% of all animals tested (N=1724) have a significant ability to relocate a specific compass bearing over 8 or more replicate tests. Animals from a given population show rather good agreement in this chosen direction, which corresponds, within a margin of error, to the seaward bearing on the population's home beach. The position of the sun is the only obvious directional cue available during the chamber tests, and talitrids apparently can adjust their menotactic orientation angle throughout the day to compensate for changes in sun azimuth. Whether this compensation corresponds perfectly with the complex acceleration function of sun azimuth is questionable, although the data are not adequate to settle the issue. A number of sources of orientation variability - both between and within individuals - arising from both motivational changes and environmental parameters, have been considered at some length.

Directional cues local to the beach habitat can also be perceived by Orchestoidea, and are used, in preference to celestial information, when the two sources conflict. When an animal is displaced from its home beach to one with a markedly differing compass bearing, it will, when released on the lower beach, move in the landward direction for the new beach. The nature of the critical local cue has been suggested by other displacement experiments to a beach which lacks high background landmarks (cliffs, etc.). Here the animals show little or no correction to local stimuli, but instead move on the bearing appropriate to their home beach, apparently using celestial information. Correction to local cues does not, apparently, realign the internal celestial compass bearing after a brief exposure to a new beach, since displaced animals revert to their home beach orientation in the chamber.

A talitrid population has been found with ahighly abnormal orientation response in the chamber. These animals live on a beach which is bathed by strong floodlights every night. They have apparently learned to orient at a constant menotactic angle to these lights while moving across the beach, and this nocturnal response has been carried over into their diurnal response to the sun. This suggests that diurnal and nocturnal celestial responses - the sun and moon compasses - are linked subsystems in a unified menotactic mechanism, with the latter taking the dominant role.

It is probable that the orientation behavior of talitrid amphipods integrates directional information from several sources, including, at least, visual cues from celestial bodies and landmarks, and possibly also non-visual information from the wind, beach slope, and other sources. The various orientation mechanisms of beachhoppers appear to be arranged in some form of dominance hierarchy, in that large landmarks, when available, are preferred as directional cues over celestial bodies, which, in turn, dominate non-visual cues. Such a hierarchy probably reflects the relative degrees of reliability in the different responses.

ABSTRACT OF THE DISSERTATION

The Role of Orchestia grillus (Talitridae, Amphipoda) in the decomposition of Spartina alterniflora litter

Glenn Robert Lopez, Doctor of Philosophy in Department of Biological Sciences (Ecology and Evolution), State University of New York at Stony Brook. 1976.

Orchestia grillus is one of the most abundant litter-feeding macroinvertebrates in the wrack zone of Spartina salt marshes on the Atlantic coast of North America. A series of laboratory experiments was conducted to determine the role of Orchestia in Spartina litter breakdown, emphasizing interactions between amphipods and micro-organisms growing on the litter. Decomposition rates of litter and assimilation efficiencies were determined using carbon, nitrogen, and gravimetric analyses. ATP determinations provided estimates of microbial biomass.

Orchestia stimulates microbial decomposition of Spartina litter, especially the nitrogen fraction, through direct grazing on the microorganisms. The amphipods do not appear to digest Spartina litter, but obtain their nutrition by efficiently assimilating living microorganisms growing on litter particles.

Amphipods may increase microbial biomass on decomposing litter through ammonia excretion and by stirring the water through locomotor activities.

Net mineralization (weight loss) of Spartina litter proceeds at a low rate and is not affected by amphipod grazing.

Microbial debris, consisting of dead cells, cements, and exudates, can become a quantitatively important fraction of Spartina detritus under certain conditions. This material is also not digested by Orchestia.

ABSTRACT OF THE DISSERTATION

SPATIAL AND ASSOCIATIONAL PATTERN IN THE HYPERIID AMPHIPOD ASSEMBLAGE OF THE NORTH PACIFIC CENTRAL GYRE

Eric Shulenberger, Doctor of Philosophy in Oceanography,
University of California, San Diego, 1976.
Professor John A. McGowan, Chairman

The North Pacific central gyre appears to be a genuine marine ecosystem; in this, it appears much unlike many other intensively-studied marine regions. Two of the first steps in the analysis of any ecosystem are to ask (1) what species occur in the system and (2) what are the patterns of distribution of these species within the system? These are the basic questions which are approached by this research, for the hyperiid amphipods occurring in the gyre. A detailed examination of gyral hyperiids has delineated strong patterns in both inter-species associations and spatial distributions. These findings of pattern lead naturally to a consideration of possible regulatory mechanisms for the observed structure.

To answer the first question (what species occur in the system), the hyperiid amphipods have been examined from an extensive series of depth-stratified bongo net tows taken at 28°N, 155°W in the North Pacific central gyre. Seventy-nine samples from six depth intervals produced 14,581 individuals belonging to 13 families, 42 genera, and 83 species. Data on depth distributions, rank-order of species abundance, sex ratios, and vertical migration are also presented (Chapter I). Most of these species are shown to be reproductively active in the gyre, and there appears to be no seasonality to their reproductive behavior. No species endemic to the gyre are yet known.

Chapter II seeks pattern among hyperiid species: Hutchinson's "paradox of the plankton" reappears. There are very many species, apparently coexisting in equilibrium although many are very closely related taxonomically and appear functionally similar.

The gyre is highly oligotrophic and these species should be in competition for a limiting resource (food): the high number of species present and their coexistence constitute the "paradox".

An attempt is made to consider the paradox (Chapter II) by analyzing the hyperiid data using recurrent group analysis. This analytical technique separated 20 species (totalling among them 90% of captured individuals) into six groups. Members of a group co-occur in samples very frequently (probably much more frequently than can be attributed to random co-occurrences). The groups are not strongly interconnected and display different depth distributions and vertical migratory behaviors.

Several groups contain, paradoxically, sets of congeneric species, in apparent violation of the competitive exclusion principle. Detailed analyses of three sets of congeners (one pair not grouped together and two sets grouped together) has shown behavioral differences between congeners. These differences, although subtle, are probably biologically significant in permitting coexistence of these closely-related species.

Three general questions are considered (Chapter II). (1) Will traditional niche-oriented concepts work in epipelagic zooplankton ecology? The answer appears to be yes; several niche axes have been identified for several hyperiid species. (2) Can these concepts be used to help resolve the paradox? Again, apparently yes; even congeneric species found grouped together can be separated along some (or several) niche axis. However, only 20 of 83 species are considered; data are insufficient on the remaining 63 species (which only include 10% of captured individuals). (3) Regulatory mechanisms for gyral community structure are discussed; apparently neither competition nor predation alone is sufficient. Different aspects of community structure are probably generated during different parts of species' life histories, and probably by different mechanisms.

THE EFFECTED LIGHT ON THE LOCOMOTOR RHYTHM AND GENERAL BIOLOGY OF TALITRUS SALTATOR (MONTAGU).

J.A. Williams

The aim of the present study was to investigate aspects of the locomotor activity rhythm of Talitrus saltator (Montagu), with particular emphasis on the environmental synchronization of the rhythm. The seasonal pattern of reproduction, the effect of photoperiod on aspects of reproductive biology, and the seasonal field distribution of T. saltator were also investigated.

Under laboratory conditions the nocturnal locomotor rhythm of T. saltator was shown to be precise and persistent with an innate circadian frequency of approximately 24.4 hrs. The expression of the rhythm is synchronized by incident LD cycles and is independent of cyclic fluctuations in relative humidity and temperature. The periodicity of the rhythm is also temperature independent (Q_{10}=1.01). Intraspecific variations of the rhythm and laboratory induced variations associated with actograph design were examined.

A semi-lunar endogenous rhythm regulating the amount of activity/ 24 hrs was demonstrated in the free running locomotor rhythm, with maximum activity correlated with the time of the nocturnal, high spring tides.

The mode of light entrainment of the locomotor rhythm was characterized, the LD cycle being shown to act as a differential synchronizer of the rhythm. Entrainment occurred through the action of transient phase shifts of the rhythm. The range of entrainment of the rhythm to symmetrical LD cycles differing from a normal 24 hr periodicity was found to be less than 6 hrs. The locomotor rhythm more or less complied with the experimental predictions of Aschoff's 'circadian rule' concerning experimentally induced variations in the periodicity and activity time: rest time ratio of the free running rhythm subjected to LL regimes.

Seasonal analyses of the locomotor rhythm established the light-on transition period to be the effective field parameter which synchronized the rhythm, the phase of the endogenous rhythm shifting in response to seasonal changes in the time of 'dawn'. Despite the seasonal change of phase there were no significant related changes in amplitude and period of the rhythm. Experimental analyses, using simulated twilight transitions substantiated the 'dawn' transition to be the

effective synchronizer of the rhythm and showed that the threshold light intensity for synchronization of the rhythm is 3.0-4 lux.

Phase control of the rhythm by LD cycles necessitiates a periodically changing sensitivity of the rhythm towards the LD cycle which can be demonstrated by a phase response curve, which is conventional in form in T. saltator. Entrainment and phase control of the rhythm by atypically phased LD cycles or nLD cycles were interpreted as the interaction of phase shifts induced in the rhythm by light stimulation of specific phases of the response curve.

The locomotor rhythms of 3 other supralittoral Peracarida, Talorchestia deshayesei, Orchestia gammarella and Ligia oceanica were also studied. All three exhibited pure circadian, endogenous rhythms. The mode and range of entrainment of T. deshayesei is similar to that of T. saltator. Synchronization of the rhythm, by LD cycles, involves a differential mode in T. deshayesei, the effective field parameter being the light-off transition with an incident intensity range of 5.0-6.0 lux required for synchronization.

A procedure for quantifying the standard periodogram analysis technique, involving computer randomization of the time-series data, is described.

The horizontal and vertical seasonal migration, within the supralittoral zone, of the T. saltator population of Derbyhaven, Isle of Man was investigated. Animals overwintered above EHWS at depths of 50 cms, in summer the population moved downshore with a concomitant reduction in the burrow depth. Endogenous rhythmicity entrained by light clearly appeared to control the timing and distribution of surface activity but navigation by T. saltator in the study area appears not to be dependent upon a time-compensated navigation mechanism related to the solar azimuth. Navigation by form vision of the skyline seems a much more likely mechanism in the populations studied.

In order to investigate the effect of incident photoperiod on the reproductive biology of T. saltator the reproductive cycle together with aspects of embryological development and field growth of T. saltator at Derbyhoven were determined. T. saltator has an annual, univoltine cycle with a period of high reproductive activity between May and late August, and brood number was shown to be dependent on the length of the incubating female and the stage of embryological development of the egg. The minimum effective photoperiod for induction of gonadal maturation in culture populations of T.

saltator is shown to be LD 14:10. Under these conditions the resultant embroyological development and juvenile growth is similar to that recorded in the field. Effective winter breeding of sexually mature specimens was achieved after a refractory period of 80-90 days under LD 16:8, which implies that incident photoperiod is the major exogenous factor timing the breeding cycle and can override conflicting endogenous factors.

REQUESTS FOR INFORMATION etc.

Parathemisto

I am trying to procure some specimens of Parathemisto spp., especially P. pacifica and P. japonica, in order to follow up work on the taxonomy and comparative morphology of the group. Please send specimens to

Martin SHEADER
Dept. of Oceanography
The University
Southampton SO9 5 NH
England

NEWS FROM COLLEAGUES

C.S. PURUSHOTANAN: I am working on the biology of estuarine amphipods of Kerala, India.

Renate WEIGMANN-HAAS: I am working on hyperiids, especially of the German Antarctic Expedition and on a checklist of literature and species. Possibly I will publish the first results in the next year.

James P. MEADOR: My work concerns the physiological ecology of benthic amphipods.

Jim LOWRY: I have been on an extended collecting trip to Macquarie Island, a very interesting trip. We made almost 200 collections right around the island. Unfortunately we weren't able to sample deeper than 20 m, because everything was done by SCUBA without boats. The collections are being sorted now. (Also, Jim wrote about seeing over 2.5 million Royal penguins, maybe half that many King and Rockhopper penquins, about 100 000 Elephant seals and quite a few Fur seals (plus 4 spp of Albatross). (SCUBA-ing in such water cannot be a very lonely occupation).

Octavian CIOLPAN: Mes premiers ëtudes sont dirigées sur l'écologie du

genre Corophium du Delta du Danube. Bien sur je veux creuser les problèmes concernants les autres Amphipodes.

Gloria M. ALONSO: I am working on marine amphipod populations of the Patagonian coast.

Yoko WAKABARA: The following colleagues are working under my tutorship: A.S. Tararam (phytal fauna especially Amphipoda), F.P. Pereira Leite (Gammaridean life cycles), M. Takeda (Caprellidean life cycles) and M.A.G. Ribeiro (Amphipoda from stomach contents of fish).

David K. CAMP: I am beginning a survey of Leucothoidae from the continental shelf off West Florida (Gulf of Mexico). My greatest source of specimens has been from the "Hourglass cruises", a 28 month sampling program to 10 established stations off the West Florida coast between 6 and 73 m depths. Approximately 25 leucothoid species have been detected in these samples and most are undescribed.

Wolfgang ZEIDLER: I am currently working on the hyperiid fauna of Southern Australia, but as this project will be completed soon I have also started work on the gammarideans and hope to continue research in that area.

K. Peethambaran ASARI: I am working for my doctoral degree on the biosystematic studies of amphipods of Portonovo. I shall study the ecophysiological aspects too.

L. P. MADIN & G.R. MADISON: We are continuing our work on hyperiids associated with other plankton and are presently working up material for two or three more papers. Our collections at present include several thousand specimens in 30 genera of hyperiid amphipods. In addition to the natural history of their associations, we plan some work on systematics of hyperiids, but probably will not get to that for a few years. Meanwhile, we would consider loaning some of our material to others in the field if it would be useful, and can supply further details about our collection upon request (VII-77)

Edward B. HATFIELD: I am currently in a post-doctoral position with Dr. Robert A. CROKER of the University of New Hampshire. We are initiating field and laboratory experiments to determine reasons for the distribution and abundance patterns of haustoriid amphipods.

Graham D. FENWICK: My interests are broad and not restricted to amphipods alone. Within amphipodology however, I am keenly interested in ecology, taxonomy and zoogeography. Currently I am working with Dr. Jim LOWRY of the Australian Museum, Sydney, in a taxonomic and zoogeographic study of the Amphipoda of New Zealand's subantarctic Snares Islands. This is now a large project involving about 25 redescriptions, 18 new species and about five new genera. We hope to conclude this during 1978 and, once I have completed a few other projects, I hope to get back to amphipod ecology.

International Symposium on Groundwater Biology

Les Watling

This symposium, combining the 4th International Colloquim on *Gammarus* and *Niphargus* and the 2nd International Symposium on Groundwater Ecology, was held at Blacksburg, Virginia, U.S.A., on September 10-16, 1978 and was attended by 46 investigators from 14 countries. The meeting was very successfully organized by Drs. A.L. Buikema and J.R. Holsinger. In addition to the papers presented, which are listed below, there was a day-trip to some nearby karst groundwater ecosystems, and a series of discussion sessions dealing with the following topics: strategies for the protection of endangered and threatened groundwater species and ecosystems; ecological classification of groundwater fauna and standardization of groundwater biotope and ecosystem terminology; revisionary concepts of gammaroidean amphipod taxonomy with emphasis on ancestral and derived characters, evolutionary patterns and creation of higher taxa; and sampling techniques for groundwater fauna. It was decided by the group that the next meeting would be held at Lodz, Poland in late summer 1980 and would be organized by Krzysztof Jazdzewski and Andrzej Skalski. The papers presented at the meeting will be published either in the Int. J. Speleol. or in a supplement to Crustaceana.

List of papers:

KARAMAN, G., and BARNARD, J.L. Revision of Genera of the Family Gammaridae (sensu auct.).

HOLSINGER, J.R., and SKALSKI, A.W. The Taxonomy and Systematic Status of *Cragonyx paxi* Schellenberg (Crangonyctidae).

GLEDHILL, T. A Redescription of Niphargus fontanus Bate (Crustacea: Amphipoda) and Designation of a Lectotype.

SKALSKI, A.W. The Variability and Systematic Position of Three Species of Niphargus from the Caucasus.

LEE, K.S., and KIM, H.S. On the Geographical Distribution and Variation of Gammarus pulex - Group in Korea.

WARD, J.V., and HOLSINGER, J.R. Distribution and Habitats of Subterranean Amphipods in the Rocky Mountains of Colorado, U.S.A.

ALOUF, N.J. Répartition des Amphipodes d'eau douce au Liban.

SCHMINKE, H.K. Parastenocarididae (Copepoda, Harpacticoidea) from Australia and Their Zoogeographic Relationships.

DANIELOPOL, D.L. Distribution of Ostracods in Groundwater of Northwestern Coast of Eubea (Greece).

MAGNIEZ, G. Biogeographical and Paleobiogeographical Problems in Stenasellids (Crustacea Isopoda Asselota of Underground Waters).

HETRICK, W.W., and GOOCH, J.L. Genetic Population Structure in an Amphipod Species.

SKET, B., and VELKOVRH, F. The Phreatic Fauna ofthe Ljubljana-Plain (Yugoslavia) - Its Distribution and Zoogeographical Relationships.

LONGLEY, G. The Edwards Aquifer: Earth's Most Diverse Groundwater Ecosystem?

JAZDZEWSKI, K. Range Extensions of Some Gammaridean Species in European Inland Waters Caused by the Human Activity.

MESTROV, M., and LATTINGER-PENKO, R. The Investigations of Mutual Influence Between Polluted River and Its Hyporheic.

MACPHERSON, B.R., and STEELE, V.J. The Microanatomy of the Central Nervous System of Gammarus setosus Dementieva (Crustacea, Amphipoda). The Sub-oesophageal Ganglion and Ventral Ganglion Chain.

BUIKEMA, JR., A.L., CHESTER, A., and STEEVES, III, H.R. Pseudotandry in Gammarus minus.

DRUCUET, J. Action De L'Ecdysterone Sur Les Femmelles De Gammarus pulex (L) (Crustaces Amphipodes). Effet Sur La Formation Des Couples Et Sur La Vitellogenese.

VASSALLO, L., and STEELE, D.H. Survival and Growth of Young Gammarus lawrencianus on Different Diets.

MATHIEU, J., and GIBERT, J. Evolution Des Teneurs En Proteines, Glucides Et Lipides D'Une Population Phreatique De Niphargus rhenorhodanensis (Crustaces, Amphipodes) Au Cours De L'Elevage Et Du Jeûne Experimental.

GIBERT, J., and MATHIEU, J. Relation Entre Les Teneurs En Proteines, Glucides Et Lipides Chez Deux Especes De Niphargus (Crustaces, Amphipodes) Soumis Au Jeûne Et Originaires De Deux Biotopes Differents.

ROUX, C., ROUX, A.L., and OPDAM, Y. Repartition Ecologique Et Metabolisme Respiratoire De Gammarus roeseli (Crustaces Amphipodes).

BULNHEIM, H.P. Studies on the Physiological Ecology of Five Euryhaline Gammarus Species.

MATHIEU, J. Activite Locomotrice Et Metabolisme Respiratoire De Deux Populations De Niphargus rhenorhodanensis Mesures A Une Temperature De 11°C.

COSTA, H.H. The Effects of Some Heavy Metal Pollutants on the Heart Beat of Gammarus pulex (L).

HIROKI, M. Relation Between the Two Diel Phenomena Shown by Fresh Water Gammarids - Drift and Vertical Migration.

MEIJERING, M.P.D. Drift, Upstream-Migration and Population Dynamics of Gammarus fossarum Koch.

HOBBS, III, H.H. Investigations of the Troglobitic Crayfish Orconectes inermis testii (Hay) in Mayfield's Cave, Monroe County, Indiana.

GOEDMAKERS, A., and PINKSTER, S. Migration of Fresh Water Gammarids

LONGLEY, G., and HOLSINGER, J.R. Subterranean Amphipod Population Dynamics Based on Organisms Sampled from an Artesian Well in Texas.

JENIO, F. The Live Cycle and Ecology of Gammarus troglophilus Hubricht and Mackin (Amphipoda: Gammaridae).

DICKSON, G.W., and HOLSINGER, J.R. Variation Among Populations of the Troblobitic Amphipod Crustacean Crangonyx anntennatus Packard (Crangonyctidae) Living in Different Habitats, III. Populations Dynamics and Stability.

GOEDMAKERS, A. Differences Between Populations of One Species of Freshwater Amphipods Within a Stream System.

PINKSTER, S. Influence of Chlorinity on Reproductive Success and Distribution of Eulimno-Gammarus obtusatus and Other Estuarine Gammarids.

DESSAIX, J., and ROUX, A.L. Structure and Dynamics of the French Upper Rhone Ecosystems X - Estimation of the Secondary Production of Gammarids in the Main Stream.

CULVER, D.C. Some Implications on Competition for Cave Stream Communities.

BOUSFIELD, E.L. A Revised Classification and Phylogeny of Amphipod Crustaceans

COLE, G.A. Mandibular Palps of the North American Freshwater Species of Gammarus.

GIBERT, J., GINET, R., MATHIEU, J. and REYGROBELLET, J.L. Structure et Fonctionnement des Écosystème du Haut-Rhône Francais. VIII - Hydrologie de Deux Stations Phréatiques dont L'Eau Alimente des Bras Morts IX - Analyse du Peuplement de Deux Stations Phréatiques Alimentant des Bras Morts.

Symposium on the Compositim and Evolution of Crustaceans in the Cold and Temperate Waters of the World Ocean

Les Watling

This symposium, one of a series to be conducted as part of the U.S. - U.S.S.R. Cooperative Program was held at the Duke University Marine Laboratory, Beaufort, N.C., U.S.A., on October 20-22, 1978. Unfortunately, due to a series of problems, no Soviet participants were able to attend the meeting. A wide range of interests were represented in the papers presented. All papers will be published in the Bulletin of the Biological Society of Washington. Those papers of interest to amphipod workers were:

STEELE, D.H. Clinal variation in the morphology of Anonyx nugax (Phipps) (Crustacea, Amphipoda).

STEELE, D.H. Zoogeography of the genus Anonyx (Crustacea, Amphipoda).

WATLING, L. Distribution and ecology of benthic Amphipoda and Cumacea from the Gulf of Maine to Cape Hatteras, USA.

BOUSFIELD, E.L. The amphipod superfamily Gammaroidea in the north Pacific region: Systematics and distributional ecology.

LAUBITZ, D.R. Phylogenetic relationships of the Podoceridae (Amphipoda, Gammaridea).

BOWEN, M.A., SMYTH, P.O., BOESCH, D.F., VAN MONTFRANS, J. Comparative biogeography of benthic macrocrustaceans of the Middle Atlantic (U.S.) continental shelf.

HERBST, G.N., WESTON, D.P., and LORMAN, J.G. The distributional response of amphipod and decapod crustaceans to a sharp thermal front north off Cape Hatteras, North Carolina.

GEORGE, R.Y. Behavioral and metabolic adaptations of Polar and deep-sea crustaceans.

LIST OF SUBSCRIBERS

(Corrections, ommissions and additions)

Deletions: Drs. Bregazzi, Evans and Jumars have written to tell me that they no longer work with amphipods.

Omissions: Dr. W.D. Williams, Dept. of Zoology, The University. Adelaide (S. Austr. 5001), Australia

Dr. Torben Wolff, Zoologisk Museum, Universitetsparken 15, DK-2100 Køhenhavn, Danmark

Dr. Kwang Il Yoo, Dept of Oceanography, Seoul National University, Seoul, S. Korea

Changes of address

Dr. John Chapman, Dept of biol. Sciences, Univ. of California, Santa Barbara (Cal. 93106), U.S.A.

Dr. James R. Chess, Southwest Fisheries Center, Tiburon Laboratory, National Marine Fisheries Center, Tiburon (Ca. 94920), U.S.A.

Dr. Peter Craig, 53 Howard Ave., Nanaimo B.C. Canada

Dr. Gary W. Dickson, Dept of Zoology, Univ. of Georgia, Athens (Ga. 30602), U.S.A.

Dr. Richard S. Fox, Dept of Biology, Lander College, Greenwood (S.C. 29646), U.S.A.

Dr. L.P. Madin, Woods Hole Oceanographic Institution, Woods Hole (Ma 02543), U.S.A.

Dr. H. Matsudo, Postal zip code for Burbank is Ca. 91505

Dr. Ulrich Schiecke, Gesellschaft f. Strahlen- u Umweltforschung, Ingolstadter Landstr. 1, D- 8042 Neuherberg, BRD.

Dr. Martin Sheader, Dept of Oceanography, The University, Southampton SO9 5NH, England

Dr. Sidney Slocum, Texas Instruments Inc., P.O. Box 5621, MS 949, Dallas (TX 75222), U.S.A.

New Subscribers

Dr. Gloria M. Alonso (P), Centro de Investigacion de Biologia Marina, Casilla de Correo 157, 1650- Buenos Aires, Argentina.

Dr. K. Peehambaran Asari, Teacher Fellow, CAS in Marine Biology, Portonovo, Tamil Nadu, 608502 S. India.

Dr. Bruce Benedict, Marine Biological Consultants, 947, Newhall St., Costa Mesa CA 92627, U.S.A.

Dr. Carter Broad, Dept Biology, West Washington State, Bellingham WA 98225, U.S.A.

Dr. Andrew Carter, Dept Oceanography, Oregon State University, Corvallis, OR 97331, U.S.A.

Dr. James T. Carlton, Dept of Geology, Univ. of California, Davis, CA 95616, U.S.A.

Dr. David K. Camp, Marine REsearch Lab., 100 Eight Avenue, S.E., St. Petersburg, FLA 33701, U.S.A.

Dr. Ken Coyle, Marine Sorting Center, Univ. of Alaska, Fairbanks AK 99701, U.S.A.

Dr. John D. DeMond, Dept of Biology, Univ of Southern Mississippi, Hattiesburg MISS 39401, U.S.A.

Dr. John Dickinson, School of Oceanography, Oregon State University, Corvallis, OR 97331, U.S.A.

Dr. Graham Fenwick, Dept of Zoology, Univ. of Canterbury, Christchurch 1, N. Zealand

Dr. J.A. Friend, Zoology Dept, Univ. of Tasmania, Box 252 C, G.P.O. Hobart, Australia 7001

Dr. Sigeo Gamo, Faculty of Education, Yokihama National University, Hodogaya-ku, Yokohama-240, Japan.

Dr. Richard Harbison, Woods Hole Oceanographic Institution, Woods Hole, MA 02543 U.S.A.

Dr. Edward B. Hatfield, Jackson Estuarine Lab., Univ. of N. Hampshire, Durham NH 03824, U.S.A.

Dr. Akira Hirayama, Amakusa Marine Biological Lab., Kyushu Univ., Tomioka, Reihoku-cho, Amakusa, Kumamoto 863-25, Japan.

Dr. Takehiko Hiwatari, Div. of Biology and Fisheries Resources, Ocean Research Inst., Univ. of Tokyo, 1-15-1, Minamidai, Makano, Tokyo 164, Japan

Dr. Peter Kinner, Normandeau Assoc., Poscataqua Marine Laboratory, Portsmouth, NH 03801, U.S.A.

Dr. Richard Klink, c/o Dr. Gilbert Jones, Dept Biology, Univ. of Southern California, Los Angeles, CA 90007, U.S.A.

Dr. Hal Koch, Dept of Biology, Western Washington State College, Bellingham WA 98225, U.S.A.

Dr. Armand Kuris, Dept of Aquatic and Population Biology, Univ. of California, Santa Barbara CA 93106 U.S.A.

Librarian, Hopkins Marine Station, Stanford Univ. Pacific Grove, CA 93950

Zoology Library, British Museum (Natural History), Cromwell Road London SW 7 England

Dr. James P. Meador, A- 002, Marine Biology Research Division, Scripps Institution of Oceanography, La Jolla CA 92037, U.S.A.

Dr. C.S. Purushothanan, Dept of Aquatic Biology and Fisheries, Univ of Kerala, Trivandrum 695 007, India

Dr. Alistair Richardson, Zoology Dept, Univ. of Tasmania, Box 252 C, G.P.O. Hobart, Australia 7001.

Dr. Isamu Shishido, Lab. of General Biology, Sendei Univ, 1-1 Yamazaki, Funaoka Shibata-sho, Miyagi 863-25, Japan.

Dr. Craig P. Staude, Friday Harbor Laboratories, Univ. of Washington, Friday Harbor WA 98250, U.S.A.

Dr. Yoka Wakabara (♀), Univ. de Sao Paulo, Instituto Oceanografico, Cidade Universitária, Butantá, Sao Paulo, Brasil

Dr. F.P. Pereira Leite
Dr. M.A.G. Riveiro
Dr. M. Takeda
Dr. A.S. Tararam
→ address as Yoko Wakabara

Dr. James V. Ward, Dept. of Zoology and Entomology, Colorado State Univ., Fort Collins COL 80523, U.S.A.

Dr. Renate Weigmann-Haass (♀), Forschungsinstitut Senckenberg, Senckenberganlage 25, 6 Frankfurt - am - Main 1, BRD

Dr. John Weintersk, Marine Biological Consultants, 947, Newhall St. Costa Mesa, CA 92627, U.S.A.

Dr. Wolfgang Zeidler, The South Australian Museum, North Terrace, Adelaide, S. Austr. 5000, Australia.

BIBLIOGRAPHY

Reviews of the recent monographs of Drs. Greze and Tzvetkova are not yet ready. Dr. Akira Taniguchi has contributed an announcement of Ishitaro Arimoto's little-known monograph of Japanese caprellids. I have been away from the Museum for most of the summer, and shall be abroad most of the autumn, so I must ask for your assistance in bringing together the references for the next Newsletter.

NEWS

Akira TANIGUCHI: Dr. I. Arimoto's monograph "Taxomonic Studies of Caprellids (Crustacea, Amphipoda, Caprellidae) found in the Japanese and Adjacent Waters, 229 pp." is now available for personal library at over-sea cost of 6,600.- (surface mail; Air mail postage will be ca. 2,000.-) This most useful book describes in English the diagnostic characteristics and distribution of 70 caprellid species found in the Japanese waters with keys to genera of Caprellinae and to species of Caprella. The book also deals with the development and sexual dimorphism of caprellids. This monograph was originally published as a part of the Special Publications from the Seto Marine Biological Laboratory, Kyoto University, Ser. III in 1976. However, since its distribution was limited to the official institutions, the Nippon Warekararui Shuppan-bu (Publishing Office of the Japanese Caprellid Research Group) plans to make the monograph, which has been cloth-covered, on sale or available for individuals. Although the book is some-what expensive, it should be the most excellent and welcome one for the amphipod people abroad as well as in Japan. The book can be ordered from:

Dr. Ishitaro Arimoto
c/o Nippon Warekararui Shuppan-bu
3-32-29, Narita-higashi
Suginamiku, Tokyo
166, Japan

BIBLIOGRAPHY 1

ADDY, J.M., 1977. Summary of the investigations of the sublittoral macrobenthos of Milford Haven. ____ Pp 18-21 in: Field Studies Council Oil Pollution Research Unit, Annual Report 1976. (Six spp of amphipods new to the area are listed on p. 20).

ARIMOTO, I & T. KIKUCHI, 1977. Caprellids obtained in the vicinity of Amakusa Islands, West Kyushu. ____Publ. Amakusa mar. biol. Lab. 4, 91-98 (14 species, all illustrated with habitus figures).

BIERHOF, M.J. & P.J. ROOS, 1977. Sedentary ciliates from two Dutch freshwater Gammarus species. ____Bijdr. Dierk. 46, 151-170. (47 Ciliata species from G. pulex and G. tigrinus)

BLANCHET, M-F., H. CHARNIAUX-COTTON, H. JUNERA, J.-J. MEUSY & C. ZERBIB, 1976. Structure et endocrinologie de l'ovaire d'Orchestia gammarellus (Crustacea Amphipoda). ____ Bull. Soc. zool. Fr. 101, 997-998.

CAINE, E., 1976. Cleansing mechanisms of caprellid amphipods (Crustacea) from North America. ____ Mar. Behav. Physiol. 4, 161-169.

CAINE, E., 1977. Feeding mechanisms and possible resource partitioning of the Capellidae (Crustacea: Amphipoda) from Puget Sound, U.S.A ____Mar. Biol. 42, 331-336.

CHARNIAUX-COTTON, H., 1976. Contrôle de la différenciation sexuelle de l'appareil génital chez les Crustacés Malacostracés; comparasion avec les Insectes. ____ Bull. Soc. zool. Fr. 101, Suppl. 4, 68-78.

DE BROYER, C., 1977. Révision des genres Ambasiopsis K.H. Barnard et Neoambasia Dahl (Crustacea, Amphipoda). ____J. nat. Hist. 11, 679-692. (Neoambasia is synonymized with Ambasiopsis. Ambasiopsis fomes is excluded from A., as is Neoambasia galatheae. The latter may be a Tryphosella (s. J.L. Barnard 1967).

DICKSON, G.W., 1977. Variation among populations of the troglobitic amphipod crustacean Crangonyx antennatus Packard living in different habitats. 1. Morphology. ____ Int. J. Speleol. 9, 43-58.

DICKSON, G.W., 1977. Behavioral adaptation of the troglobitic amphipod crustacean Crangonyx antennatus to stream habitats. ____ Hydrobiologia 56, 17-20.

DORJES, J., 1977. Uber die Bodenfauna des Borkum Riffgrundes (Nordsee). ____ Senckenberg. marit. 9, 1-17.

DORJES, J. & H.-E. REINECK, 1977. Fauna und Fazies einer Sandplate (Mellum Bank, Nordsee). ____Senckenberg. marit. 9, 19-45.

FRITH, D.W., 1977. A preliminary analysis of the associations of amphipods Microdeutopus damnoniensis (Bate), M. anomalus (Rathke) and Corophium sextoni Crawford with sponges Halichondria panicea (Pallas) and Hymeniacidon perleve (Montagu). ____Crustaceana 32, 114-118.

GILBERT, J., 1976. Ecophysiologie de Niphargus, Crustacé Amphipode troglobie. ____Bull. Soc. zool. Fr. 101, 950-951.

GILBERT, J., R. GINET, J. MATHIEU, J.L. REYGRO BELLET & A. SEYED-REIHANI, 1977. Structure et fonctionnement des ecosystémes du Haut-Rhône francais. 4. Le peuplement des eaux phréatiques, premiers résultats ____Annls Limnol. 13, 83-97 (Amphipoda on p. 92: 3 Salentinella, 1 Niphargopsis, 3 Niphargus, 1 Gammarus).

GOTSHALL, D.W., 1977. Stomach contents of northern California Dungeness crabs, Cancer magister. ____Calif. Fish. Game 63, 43-51. (Surprisingly these crabs eat a lot of amphipods.)

HARTWICK, R.F., 1977. Beach orientation in talitrid amphipods: capacities and strategies. ____Behav. Ecol. Sociobiol. 1, 447-458.

HARTWICK, R.F., 1976. Aspects of celestial orientation behavior in talitrid amphipods. ____Pp 189-197 in P. DeCOURSEY (ed.) Biological rhythms in the marine environment. Columbia, S.C., Univ. of S. Carol. Press.

HISCOCK, S., 1977. Investigation into the toxicity of refinery effluents. ____ Pp. 24-25 in: Field Studies Council Oil Pollution Research Unit, Annual Report 1976. (Some tests of Gammarus chevreuxi's swimming activity)

JUNÉRA, H., M. MARTIN, A. SOLARI & J.-J. MEUSY, 1977. Détermination du poids moléculaire de la vitellogénine et des lipovitellines d'Orchestia gammarellus, Crustacé Amphipode. ____ C.R. Acad. Sci. Paris 285 D, 909-912.

KARAMAN, G.S., 1976. Contribution to the knowledge of the Amphipoda 79. The redescription of Gammarus fossarum bodanicus Schell. 1934, one forgotten subspecies from Boden Lake (from Gammaridae). ____ Poljoprivredo i Sumarstvo 22, 13-22.

Kikuchi, T., 1977. Biological survey of benthic macrofauna in Chijiwa Bay, West Kyushu. 1. Introduction. ____ Publ. Amakusa mar. biol. Lab. 4, 117-125.

KOCH-KALLNBACH, M.E. & M.P.D. MEYERING, 1977. Durations of instars and praecopulae in Gammarus pulex (Linnaeus, 1758) and Gammarus roeselii Gervais, 1835 under semi-natural conditions ____ Crustaceana Suppl. 4, 120-127.

LEVINTON, J.S., G.R. LOPEZ, H. HEIDEMANN LASSEN & U. RAHN, 1977. Feedback and structure in deposit-feeding marine benthic communities. ____ Proc. 11th eur. Symp. mar. Biol. 409-417. ("Feeding on detritus by Orchestia grillus enhances microbial growth and detrital mineralization".)

LOPEZ, G.R., J.S. LEVINTON & L.B. SLOBODKIN, 1977. The effect of grazing by the detritivore Orchestia grillus on Spartina litter and its associated microbial community. ____Oecologia (Berlin) 30, 111-127.

MAUCHLINE, J., 1977. Growth and molting of Crustacea, especially Euphausiids. ____Pp 401-422 in N.R. Andersen & B.J. Zahuraned (eds.) Oceanic Sound Scattering Prediction. Plenum Press.

MAYRAT, A., 1976. Yeux simples et yeux composées chez les Crustacés. ____ Bull. Soc. zool. Fr. 101, 1012-1013 (i.a. studies on Orchestia and Ampelisca)

MEYERING, M.P.D., 1977. Neues Leben in der Fulda. ____Umschau Wissensch. Techn. 77, 475-477. (After a purification plant was taken in use, Gammarus species were again found).

MEYERING, M.P.D., 1977. Einbürgerung von Brackwassertiere aus Nord- und Ostsee in der Werra. ____Mittlg. Erg. Stud. Okol. Umweltf. 1977 (1), 12-18 (i.a. Gammarus tigrinus)

MEYERING, M.P.D., 1977. Quantitative relationships between drift and upstream migration of Gammarus fossarum Koch, 1835. ____ Crustaceana Suppl. 4, 128-135.

MONK, D.C., 1977. The digestion of cellulose and other dietary components, and pH of the gut in the amphipod Gammarus pulex (L). ____ Freshw. Biol. 7, 431-440.

PEMBERTON, R., 1976. Sea trout in North Argyll sea lochs: II diet. ____ J. Fish Biol. 9, 195-208 (Diet included amphipods in 33-42% of the fishes examined).

PETERSON, S.R. & R.S. ELLARSON, 1977. Food habitats of Oldsquaws wintering on Lake Michigan. ____Wilson Bull. 89, 81-91 (Principal food item is Pontoporeia affinis, in 88-95% of the ducks)

POR, F.D., 1977. Lessepsian migration. The influx of Red Sea biota into the Mediterranean by way of the Suez Canal. ____Springer Verlag, Berlin-Heidelberg-New York, 210 pp (Not seen).

SCHOLZ, E. & M.P.D. MEYERING, 1975. Vergleichende Untersuchungen zur Abwasserresistenz von Gammarus pulex L. und Gammarus roeseli Gervais in Osthessischen Flieszgewässern. ____ Beitr. Naturk. Osthessen (1975), 81-85.

THE SECRETARY, International Commission on Zoological Nomenclature, 1977. The international code of zoological nomenclature: proposals for substantive amendments put forward by the editorial committee of the commission Z.N. (G) 182. ____ Bull. zool. Nomencl. 34, 167-173.

SEGERSTRÅLE, S.G., 1977. The taxonomic status and prehistory of the glacial reflict Pontoporeia (Crustacea Amphipoda) living in North American lakes. ____Commentat. biol. 89, 1-18.

SHULENBERGER, E., 1977. Hyperiid amphipods from the zooplankton community of the North Pacific Central gyre.____Mar. Biol. 42, 375-385. (83 spp in 42 genera).

STOCK, J.H., 1977. Whale-lice (Amphipoda, Cyamidae) on Lagenorhynchus albirostris in Dutch waters. ____Crustaceana 32, 206 (Scutocyamus parvus and Isocyamus delphinii).

VADER, W., 1977. Occurrence and biotope of Gammarus zaddachi Sexton, 1912, in western and northern Norway. ____Crustaceana, Suppl. 4, 192-200.

VADER, W., 1977. (The brackish-water amphipod Gammarus zaddachi in Finnmark.) _____Fauna, Oslo 30, 127-133. (Norwegian with English summary)

WILDISH, D.J., N.J. POOLE & D.D. KRISTMANSSON, 1977. Temporal changes of sublittoral macrofauna in l'Etang inlet, caused by sulfite pulp mill pollution. ____Fish. mar. Serv. techn. Rept 718, 1-13.

WITHERS, R.G., 1977. Soft-shore macrobenthos along the South-west coast of Wales. ____Est. Coast. mar. Sci. 5, 467-484.

ZAUKE, G.P., 1977. Mercury in benthic invertebrates of the Elbe estuary ____Helgol. wiss. Meeresunters 29, 358-374 (i.a. Corophium volutator and "gammarids")

BIBLIOGRAPHY 2

ANDRES, H.G. & N. LOTT, 1977. Verzeichnis der Typen aus dem Sammlung Crustacea des Zoologischen Instituts und Zoologischen Museums der Universität Hamburg. Amphipoda, Gammaroidea. ____Mitt. Hamburg. zool. Mus. Inst. 74, 53-64 (See also A.N. 9, p. 24)

ARMENGOL, J., 1976. (Aquatic Crustacea of the Coto Donana). ____Oecol. aquat. 2, 93-97 (In Spanish, not seen).

BAJCHAROV, V.M. & V.P. SEMENCHENKO, 1977. (Size-weight characteristics and caloric content of Pontoporeia affinis Lindstr. (Crustacea, Amphipoda) from different habitats. ____Gidrobiol. Zh. 13 (2), 70-73 (In Russian, not seen)

BECKETT, D.C., P.A. LEWIS & J.R. HOLSINGER, 1977. Report of an amphipod species new to Ohio: Gammarus minus Say (Amphipoda:Gammaridae). ____Ohio J. Sci. 77, 242-243.

BELYAEV, G.M., 1976. (Pelagic and near-bottom fauna of greatest ocean depths). ____Tr. Inst. Okeanol. 99, 178-196. (In Russian, not seen). (Of 57 spp of pelagic and near-bottom animals listed, 20 are amphipods).

BIRKLUND, J., 1977. Biomass, growth and production of the amphipod Corophium insidiosum Crawford, and preliminary notes on Corophium volutator (Pallas) ____Ophelia 16, 137-203.

BOUSFIELD, E.L., 1977. A new look at the systematics of Gammaroidean Amphipods of the world. ____Crustaceana, Suppl. 4, 282-316 (In this review, the gammarids are regrouped in 6 superfamilies: 1. Gammaroidea Leach, 1814, with 10 "family groups": Gammaridae Leach, 1814, "hypogean large gammarids" (Typhlogammarus c.s.), Pontogammaridae n. fam, "parasitic species" (Cardiophilus, Behningiella, Zernovia), "gammaroids with subchelate pereopods" (Iphigenella, Pachyschesis), Acanthogammaridae Garjajeff, 1901, Macrohectopidae Sowinski, 1915, Anisogammaridae n. fam., Mesogammaridae n. fam., and "fossorial marine gammarid" ("Micruropus" alaskensis, to be redescribed as new genus). 2. Melitoidea Bousfield, 1973, with 3 family groups: Hadziidae S. Karaman, 1932, Melitidae Bousfield, 1973 (emend), and Carangoliopsidae n. fam. 3. Crangonyctoidea Bousfield, 1973, with 4 family groups: "Phreatogammarus complex",

Paramelitidae n. fam., Neoniphargidae n. fam., and Crangonyctidae Bousfield, 1973 (see Holsinger 1977). 4. Niphargoidea G. Karaman, 1962, with 3 family groups: Niphargidae G. Karaman, 1962, "niphargoids with dissimilar gnathopods" (Pseudoniphargus, Allocrangonyx), "niphargoids of Madagascar (Austroniphargus). 5. Bogidiellоidea Hertzog, 1933, with 2 family groups: Bogidiellidae Hertzog, 1933 (revised) and "bogidiellоids with sternal gills and unequal rami ur. 3" (Pseudocrangonyx, Procrangonyx, Sternophysinx & Paracrangonyx). 6. Melphidippoidea Stebbing, 1899, with 3 family groups: Melphidippidae Stebbing, 1899, "melphidippoids with large coxas and ur. 3 peduncle not elongate" (Hornellia, Metaceradocus, Parapherusa, Cheirocratus, Cheirocratella, Casco), and "fossorial melphidippoids" (Megaluropus). The Salentinellidae n. fam. (Salentinella and Parasalentinella are removed to the synopiid group families, the Gammarellidae n. fam. (Gammarellus, Weyprechtia) to the pontogeneiid group families (also, Awacaris Ueno is provisionally removed to the Pontogeneiidae), and the Caspicolidae Birstein, 1945 to a superfamily incertae sedis.).

BOWMAN, Th. E., 1977. Orchestia vaggala n. sp., a new land-hopper from the Galapagos Islands (Crustacea: Amphipoda: Talitridae). _____Proc. biol. Soc. Wash. 90, 658-668.

BULNHEIM, H.-P. 1977. Effect of inbreeding on the relative fitness of the amphipod Gammarus duebeni Liljeborg, 1852. ____ Crustaceana, Suppl. 4, 3-14

CAINE, E.A., 1976. Cleansing mechanisms of caprellid amphipods (Crustacea) from North America. ____Mar. Behav. Physiol. 4, 161-169

CAMP, D.K., N.H. WHITING & R.E. MARTIN, 1977. Nearshore marine ecology at Hatchinson Island, Florida, 1971-1974. 5. Arthropods. ____ Fla mar. Res. Publs 25, 1-63 (Preliminary identifications of 30 spp, among which several n. spp, on pp. 18-23. Further taxonomic work to be carried out by Kris Thoemke and Ed Bousfield).

CEDERWALL, H., 1977. Annual macrofauna production of a soft bottom in the northern Baltic proper. Pg 155-164 in B.F. Keegan, P. O'Ceidigh & P.J.S. Boaden (eds). Biology of benthic organisms. Pergamon Press (Pontoporeia affinis produced 3.2 g dry weight (equalling 71 kJ) m^{-2} yr^{-1}, P. femorata 3.0 g dry weight (68 kJ), at a station 46 m deep in the N. Baltic).

CROMPTON, D.W.T., 1975. Relationships between Acanthocephala and their hosts._____ Symp. Soc. exp. Biol. 29, 467-504.

DAHL, E., 1976. Structural plans as functional models exemplified by the Crustacea Malacostraca. _____ Zool. Scripta 5, 163-166.

DAHL, E., 1976. The amphipod functional model and its bearing upon systematics and phylogeny. _____ Zool. Scripta 6, 221-228.

DAVIS, W.P., B.S. HESTER, R.Y. YOAKUM & R.G. DOMEY, 1977. Marine ecosystem testing units: design for assessment of benthic organism responses to low-level pollutants. _____ Helgol. wiss. Meeresunters. 30, 673-681 (In the system tested, in S. Carolina, USA, amphipods are by far the dominat organisms. Further work on this group is apparently envisaged)

DIELEMAN, J., 1977. Circatidal activity rhythms and the annual migration cycle in an estuarine populations of Gammarus zaddachi Sexton, 1912. _____ Crustaceana, Suppl.4, 81-87.

DORGELO, J., 1975. Comparative ecophysiology of gammarids (Crustacea, Amphipoda) from marine, brackish and freshwater habitats exposed to the influence of salinity-temperature combinations. 2. Preference experiments. _____ Verh. int. Ver. theor. angew. Limnol. 19, 3007-3013 (not seen).

DORGELO, J., 1977. Comparative ecophysiology of two intertidal gammarids and the problem of zonation. _____ Crustaceana, Suppl. 4, 64-80 (Field observations (no vertical zonation) and different types on experiments on Chaetogammarus marinus and Eulimnogammarus obtusatus)

FISHELSON, L., 1977. Stability and instability of marine ecosystems, illustrated by examples from the Red Sea. _____ Helgol. wiss. Meeresunters. 30, 18-29 (Deals i.a., in general terms, with amphipods from stable and disturbed algal habitats near Eilat).

FLUGGE, H., 1977. Zur Taxonomie von Corophium arenarium und C. volutator (Crust.:Amphipoda:Corophiidae). _____ Abh. Verh. naturw. Ver. Hamburg 20, 113-122.

GEORGIADIS, G., 1977. Die Auswirkung verschiedener Temperatur-und Salinitatskombinationen auf Gammarus fossarum Koch, 1835. _____ Crustaceana, Suppl.4, 112-119.

GIBERT, J., 1977. Recherches sur la pigmentation de Niphargus virei Chevreux, 1896. _____ Crustaceana, Suppl.4, 45-57.

GINET, R., 1977. Amphipodes troglobies d'Espagne. _____ Crustaceana, Suppl. 4, 173-176 (Niphargus longicaudatus, Crangonyx cf. subterraneus, Pseudoniphargus africanus and Haplogynglimus aff. bragai).

GLEDHILL, T., 1977. Numerical fluctuations of four species of subterranean amphipods during a five year period. _____ Crustaceana Suppl. 4, 144-152 (Crangonyx subterraneus, Niphargus k. kochianus, N. fontanus and N. aquilex)

GRAF, F., 1977. Evolution of calcium storage and urate-containing cells in Niphargus schellenbergi Karaman, 1932. _____ Crustaceana Suppl. 4, 317-318 (Abstract only).

GREZE, I.I., 1977. Life cycle of Gammarus aequicauda (Martynov, 1931) in the Black Sea. _____ Crustaceana Suppl. 4, 88-90.

GULLIKSEN, B., 1977. Studies from the "UWL Helgoland" of the macrobenthic fauna of rocks and boulders in Lübeck Bay (western Baltic Sea). ____Helgol. wiss. Meeresunters. 30, 519-526.

HAYAKAWA, Y., 1976. An estimate of the permissible limits of the number of boats moored in Moroisa Cove. A calculation based on the evaluation of acute toxicity of the anti-fouling paint. ____ Bull. Jap. Soc. Fish. Oceanogr. 29, 15-29. (Not seen. The first study I have heard of, in which a caprellid, i. e. Caprella penantis, has been used as test animal).

HOLSINGER, J.R., 1977. A review of the systematics of the holarctic amphipod family Crangonyctidae. ____Crustaceana. Suppl. 4, 244-281. (After this thorough review the Crangonyctidae consist of the genera Crangonyx, Palaeogammarus, Synurella, Lyurella, Stygobronus and Bactrurus. The genera Protocrangonyx, Metacrangonyx, Procrangonyx and Pseudocrangonyx are also considered, but excluded from the family, albeit with some doubt in the case of Procrangonyx).

HUSMANN, S., 1977. Studies on subterranean drift of stygobiont crustaceans (Niphargus, Crangonyx, Graeteriella). ____ Crustaceana, Suppl. 4, 318- (Abstract only).

INGÓLFSSON, A., 1977. Distribution and habitat preferences of some intertidal amphipods in Iceland. ____ Acta Naturalia Islandica 25, 1-28 (A most useful study, giving many new data).

INGÓLFSSON, A., 1976. (Zonal distribution of plants and arthropods on a salt marsh in SW Iceland). ____ Natturufraefingurinn 46, 223-237 (Icelandic with English summary. Contains data on Orchestia gammarellus).

INSTINSKY, T., 1977. Eine neue Salinitätsorgel und ihre Anwendung zur Ermittlung der Cl-Präferenz von Gammarus fossarum Koch, 1835. ____ Crustaceana, Suppl. 4, 106-11.

IVANOVA-KAZAS, O.M., 1977. (Analysis of the early development of crustaceans. 1. The main variant of early development.) ____ Biol. Morya (Vladiv.) 1, 3-19 (In Russian with English summary. Not seen)

JAZDZEWSKI, K., 1977. Remarks on the morphology of Gammarus fossarum Koch, 1835, and Gammarus kischineffensis Schellenberg, 1937. ____ Crustaceana, Suppl. 4, 201-211.

JONES, E.B.G., R.D. TURNER, S.E.J. FURTADO & H. KUHNE, 1976. Marine biodeteriogenic organisms. 1. Lignicolous fungi and bacteria and the wood boring Mollusca and Crustacea. ____ Int. Biodeterior. Bull. 12, 120-134 (Not seen).

JUST, J., 1977. Amphyllodomus incurvaria gen. et. sp. n. (Crustacea, Amphipoda), a remarkable leaf-cutting amphithoid from the marine shallows of Barbados. ____Zool. Scripa 6, 229-232.

KARAMAN, G.S., 1977. Contribution to the knowledge of the Amphipoda. 78. Niphargus elegans Garbini, 1894, in Italy. ____ Crustaceana, Suppl. 4, 177-187.

KARAMAN, G.S. & S. PINKSTER, 1977. Freshwater Gammarus species from Europe, North-Africa and adjacent regions of Africa (Crustacea-Amphipoda) Part II. Gammarus roeseli-group and related species. ____ Bijdr. Dierk. 47, 165-196 (Deals with G. roeseli (includes G. triacanthus and ssp., and G. vardarensis), G. pavo n. sp., G. goedmakersae n. sp. G. argaeus, G. stojicevici S. Karaman (orginally described as ssp of G. argaeus), G. mladeni n. sp. and G. obnixus n. sp.)

KINZELBACH, R. & W. CLAUS, 1977. Die Verbreitung von Gammarus fossarum Koch, 1835, G. pulex (Linnaeus, 1758) und G. roeseli Gervais, 1835, in den linken Nebenflüssen des Rheins zwischen Wieslauter und Nahe. ____Crustaceana, Suppl. 4, 164-172.

KOS, M.S., 1976. (Zooplankton of the Possjet Bay) ____ Trans. Inst. mar. Biol., Far East Sci. Centre, Acad. Sci USSR 6, 65-93 (In Russian. Samples of "bottom plankton" at depths to 21 m contained many neritic amphipods, which are tabulated)

KUDRJASCHOV, V.A., T.F. TARAKANOVA & M.B. IVANOVA, 1976. (On the fauna and the flora of the intertidal zone of the Shantar islands). ____ Trans. Inst. mar. Biol., Far East Sci. Centre, Acad. Sci. USSR 6, 22-64. (Contains a wealth of information, for those who can read Russian).

LEVINGS, C.D., 1976. Intertidal invertebrates and habitats at the Kitimat river estuary. ____ Manuscr. Rep. Ser. Fish. Res. Bd Can. 1397, 1-15 (Not seen).

MARCH, B.G.E. de, 1977. The effects of photoperiod and temperature on the induction and termination of reproductive resting stage in the freshwater amphipod Hyalella azteca (Saussure). ____ Can. J. Zool. 55, 1595-1600.

MATHIEU, J., 1977. Variations de la masse de Niphargus longicaudatus rhenorhodanensis Schellenberg, 1937, en fonction de l'origine des animaux et de la durée de leur élevage. ____ Crustaceana, Suppl. 4, 136-143.

MILLER, J.D. & A.D. BUIKEMA, 1977. The effect of substrate on the distribution of the spring form (Form III) of Gammarus minus Say, 1818. ____ Crustaceana, Suppl. 4, 153-163.

MOORE, P.G., 1977. Organization in simple communities, observations on the natural history of Hyale nilssoni (Amphipoda) in high littoral seaweeds. ____ Pp 443-451 in B.F. Keegan, P. O'Ceidigh & P.J.S. Boaden (eds.) Biology of benthic organisms. Pergamon Press. (Not seen).

OTTE, G., 1975. A laboratory key for the identification of Corophium species (Amphipoda, Corophiidae) of British Columbia. ____ Fish. mar. Serv. techn. Rep. 519, 1-19 (A key to the 5 B.C. Corophium spp, with notes on an additional 7 species).

PINKSTER, S., H. SMIT & N. BRANDSE- de HONG, 1977. The introduction of the alien amphipod, Gammarus tigrinus Sexton, 1939, in the Netherlands and its competition with indigenous species. ____Crustaceana, Suppl. 4, 91-105.

REPELIN, R., 1972? Observations sur la distribution des Phronimidae (Crustacés Amphipodes) dans le Pacifique occidental de 5° N à 20° S. ____ Cah. ORSTOM, Ser. Oceanogr. 10, 189-201.

REYGROBELLET, J.L., 1977. Spermatogénèse et rythmes troglobies chez Niphargus virei Chevreux, 1896. ____ Crustaceana, Suppl. 4, 15-44.

ROUX, A.L., 1975. Température stable et température fluctuante. 2. Etude comparative de leurs effets sur la durée d'intermue de Gammaridae femelles. ____ Verh. int. Ver. theor. angew. Limnol. 19, 3014-3021. (Not seen)

SHEADER, M. 1977. Breeding and marsupial development in laboratory maintained Parathemisto guadichaudi (Amphipoda). ____ J. mar. biol. Ass. U.K. 57, 943-954.

SHEADER, M., 1977. Production and population dynamics of Ampelisca tenuicornis (Amphipoda) with notes on the biology of its parasite Sphaeronella longipes (Copepoda). ____ J. mar. biol. Ass. U.K. 57, 955-968.

SKET, B., 1977. Niphargus im Brackwasser. ____ Crustaceana. Suppl. 4, 188-191 (In Dalmatian brackish waters, N. hebereri is common, while N. salonitanus, N. n. sp. aff rejici and N. hvarensis were caught rarely).

SPRAGUE, V., 1977. 1. Classification and phylogeny of the Microsporidia. 2. Annotated list of species of Microsporidia. 3. The zoological distribution of Microsporidia. ____ These 3 papers make up: L.A. Bulla, T.C. Cheng & V. Sprague (eds) Comparative Pathobiology, vol. 2. Systematics of the Microsporidia. Plenum Publishing Corp., New York, 446 pp (Not seen).

STEELE, V.J., D.H. STEELE & B.R. MACPHERSON, 1977. The effect of photoperiod on the reproductive cycle of Gammarus setosus Dementieva 1931. ____ Crustaceana, Suppl. 4, 58-63.

STOCK, J.H., & T. GLEDHILL, 1977. The Niphargus kochianus- group in north-western Europe. ____Crustaceana, Suppl. 4, 212-243. (The taxon is divided in N. pachypus (new status) and N. kochianus, with 3 ssp. N. k. kochianus in England, N. k. irlandicus in Ireland and N. k. dimorphopus n. ssp. in the Benelux-countries)

WEISER, J., 1976. Microsporidia in invertebrates: host-parasite relations at the organismal level. ____ In L.A. Bulla & T.C. Cheng (eds) Comparative Pathobiology. vol. 1. Biology of the Microsporidia. Plenum Publishing Corp., N. York, 371 pp (Not seen)

WHITLATCH, R.B., 1977. Seasonal changes in the community structure of the macrobenthos inhabiting the intertidal sand and mud flats of Barnstable harbor, Massachusetts. ____ Biol. Bull. (Wood's Hole) 152, 275-294.

WIEDERHOLM, T. & L. ERIKSSON, 1977. Effects of alcohol-preservation on the weight of some benthic invertebrates. ____Zoon 5, 29-31. (i.a. Pontoporeia affinis)

WOLFF, T., 1977. Diversity and faunal composition of the deep-sea benthos. ____Nature, Lndn 267, 780-785 (Not seen).

ZHIRMUNSKIJ, A.V. (ed) 1976 (Animals and plants from Peter the Great Bay) ____Nauka, Leningrad, 363 pp (In Russian, not seen).

BIBLIOGRAPHY 3

AFONSO, O., 1977. Contribution à l'étude des Amphipodes des Acores-description d'une nouvelle espèce. - Publcs Inst. zool. "Augusto Nobre" 135, 1-32. (The new species is Orchestia mateusi, a terrestrial Orchestia)

ALOUF, N.J., 1977. Nouvelles données sur l'ecologie et la biogéographie de Niphargus nadarini Alouf (Crustacés, Amphipodes). Int. J. Speleol. 9, 59-63.

ANGER, K., 1977. Benthic invertebrates as indicators of organic pollution in the western Baltic Sea. ____ Int. Rev. ges. Hydrobiol. 62, 245-254.

BAREL, C.D.N. & P.G.N. KRAMERS, 1977. A survey of the echinoderm associates of the North-East Atlantic area. ____ Zool. Verh., Leiden 156, 1-159 (Amphipods on pp. 79-80. This list is unfortunately sadly incomplete).

BARNARD, J.L., 1977. The cavernicolous fauna of Hawaiian lava tubes 9. Amphipoda (Crustacea) from brackish lava ponds on Hawaii and Maui. ____ Pacif. Ins. 17, 267-299. (New taxa: Grandideriella palama, G. koa, Paramoera rua, P. lokowai, P. paakai, Hadzia (Liagoceradocus) lonomaka and Rotomelita n. gen. (Melitidae) with the species R. lokoa and R. ana. Nuuanu amikai is reillustrated)

BARNARD, J.L., 1978. Redescription of the amphipod Calliopiella michaelseni Schellenberg from South Africa, with comparison to a new genus from the Pacific Ocean. ____ Ann. S. Afr. Mus. 75, 33-40 (The new genus, Callaska, with Calliopiella pratti as type-species, may well be a junior synonym of Paraleptamphopus Tzvetkova & Kudrjaschov, 1975 (a paper not cited by Barnard).

BARTON, D.R. & H.B.N. HYNES, 1978. Seasonal study of the fauna of bedrock substrates in the wave zones of lakes Huron and Erie. ____ Can. J. Zool. 56, 48-54 (Hyalella azteca (L. Huron) and Gammarus fasciatus (L. Erie) are among the dominant species).

BAUDOIN, M., 1975. Host castration as a parasite strategy. ____ Evolution 29, 335-352.

BELLAN-SANTINI, D. & R.A. KAIM-MALKA, 1977. Ampelisca nouvelles de Méditerranée (Crustacea - Amphipoda). ____ Boll. Mus. Civ. St. Nat. Verona 4, 479-523 (Descriptions and figures of Ampelisca spinifer, A. unidentata, A. pseudosponimana n. sp. (=A. spinimana of earlier Med. auth.), A, calypsonis n. sp., A. vervecei n. sp., A. multispinosa n. sp., A. ledoyeri n. sp., A. ruffoi n. sp., A. antennata n. sp., A. truncata n. sp., A. provincialis n. sp. A. pseudosarsi n. sp. A. jaffaensis n. sp., A. anophthalma n. sp. A. planierensis n. sp. and A. massiliensis n. sp., No less than 26 Ampelisca spp are now reported from the Med.)

BELLAN-SANTINI, D. & D.J. REISH, 1977. Utilisation de crustacés peracarides marins (isopodes et amphipodes) dans les études de toxicologie. ____ Rev. int. Oceanogr. Med. 48, 103-105 (Not seen)

BENEDICT, J.A., 1977. Mayerella acanthopoda, a new species (Amphipoda, Caprellidae) from Southern California. ____ Crustaceana 33, 47-55.

BENSON, J.A., 1977. Entrainment of a circadian rhythm of activity in an amphipod by skeleton photoperiods. ____ J. interdiscipl. Cycle Res. 8, 37-46. (Not seen).

BORODITCH, N.D., 1978. (The Caspian Peracarida (Crustacea) in the Saratov Water Reservoir). ____ Zool. Zh 57, 783-785 (In Russian. Eight species of amphipods, excluding Corophium)

BRODIE, D.A. & K. HALCROW, 1977. The ultrastructure of the sinus gland of Gammarus oceanicus (Crustacea: Amphipoda). ____ Cell Tiss. Res. 182, 557-564.

BULNHEIM, H. -P., 1978. Interaction between genetic, external and parasitic factors in sex determination of the crustacean amphipod Gammarus duebeni. ____ Helgol. wiss. Meeresunters. 31, 1-33.

BUSHUEVA, I.V., 1977. (About ecology and distribution of Amphipoda - Gammaridae in shoal waters of the Novaya Zemlya and Franz Josef Land). ____Explor. Seas SSSR 14 (22), 277-290 (In Russian, with English summary. Contains i.a. an analysis of growth, and a calculation of sustaining production and growth production for the dominant species, Apherusa glacialis)

CADDY, J.F., T. AMARATUNGA, J.J. DADSWELL, T. EDELSTEIN, L.E. LINKLETTER, B.R. McMULLIN, A.B. STASKO & H.W. v.d. POLL, 1977. 1975 Northumberland Strait Project. 1. Benthic fauna, flora, demersal fish and sedimentary data. ____ Manuscr. Ser., Fish. mar. Sc. (1431), 1-51. (Not seen).

CINIGLIO, A.E. & J.F. PAYNE, 1977. New distrubutional records for three species of gammarid amphipods. ____ Crustaceana 32, 103-106. (Gammarus troglophilus, G. m. minus & G. pseudolimnaeus in Tennessee).

COINEAU, N., 1977. Le genre Pseudingolfiella aux Kerguelen. ____ C.N.F.R.A. 42, 287-294 (Not seen. Is the reference complete?)

DABBAGH, S.A. & I.C. BAID, 1977. Some histochemical reactions on the neurosecretory cells of Rivulogammarus syriacus Chevreux (Crustacea, Amphipoda). ____Acta biol. Acad. Sci. Hung. 27 (1976), 309-316 (Not seen)

DE BROYER, Cl., 1977. Analysis of the gigantism and dwarfness of Antarctic and subantarctic Gammaridean Amphipoda. ____ Proc. 3. SCAR Symp. antarct. Biol., 327-334.

DICKINSON, J.J. & A.G. CAREY, 1978. Distribution of gammarid Amphipoda (Crustacea) on Cascadia abyssal plain (Oregon). ____ Deep-Sea Res. 25, 97-106.

DORGELO, J., 1977. Comparative ecophysiology of gammarids (Crustacea: Amphipoda) from marine, brackish - and fresh-water habitats exposed to the influence of salinity-temperature combinations 4. Blood sodium regulation. ____ Neth. J. Sea Res. 11, 184-199.

DORGELO, J., 1977. Salt tolerance, salt preference and blood sodium regulation in Gammarus roeseli Gervais, 1835 (Crustacea: Amphipoda). ____ Hydrobiol. Bull. 11, 56-61.

ELKAIM, B., 1976. Bionomie et écologie des peuplements des substrats meubles d'un estuaire atlantique marocain: l'estuaire du Bou Regreg. 2. Unités indicatrices peu liées à l'étagement, ou mediolittorales. ____ Vie Milieu 26 B, 199-241.

ELKAIM, B., 1978. idem 3. Unités indicatrices supralittorales ou en position supralittorale. ____ Vie Milieu 27 B (1977), 27-83.

FEDER, H.M. & D. SCHAMEL, 1976. Shallow-water benthic fauna of Prudhoe Bay. ____Pp 329-359 in "Assessment of the Arctic Marine Environment. Selected Topics".

FENWICK, G.D., 1977. Mesoproboloides excavata n. sp. (Amphipoda: Gammaridea: Stenothoidae) from New Zealand. ____ N.Z. J. mar. Freshw. Res. 11, 471-478.

FRIEND, J.A. & A.M.M. RICHARDSON, 1977. A preliminary study of niche partition in two Tasmanian terrestrial amphipod species. ____ Ecol. Bull. (Stockh.) 25, 24-35.

FUKUCHI, M., 1977. Regional distribution of Amphipoda and Euphausiacea in the northern North Pacific and Ber-ing Sea in summer of 1969. ____ Res. Inst. N. Pacif. Fish., Hokkaido Univ., spec. Vol., 439-458.

FUKUCHI, M., Y. YOSHIDA & A. HARA, 1971. An observation on the feeding behaviour of macrozooplankton. ____ Bull. Plankton Soc. Japan 18, 62-64.

GABLE, M.F. & R.A. CROKER, 1978. The salt marsh amphipod Gammarus palustris Bousfield, 1969, at the northern limit of its distribution. 2. Temperature-salinity tolerance. ____ Est. coast. mar. Sci. 6, 225-230.

GENTIL, F. & J.M. BERMUDEZ, 1976. Nouvelles espèces pour l'inventaire de la faune marine de la région de Roscoff: Annélides Polychètes, Crustacés (Cumacés et Amphipodes), Echinodermes. ____ Trav. Stn. biol. Roscoff (N.S.) 23, 5-8.

GINN, T.C. & J.M. O'CONNOR, 1978. Response of the estuarine amphipod Gammarus daiberi to chlorinated power plant effluent. ____ Est. coast. mar. Res. 6, 459-470.

GOSS-CUSTARD, J.D., 1977. The energetics of prey selection by Redshank Tringa totanus (L.) in relation to prey density. ____ J. Anim. Ecol. 46, 1-19.

GOSS-CUSTARD, J.D., 1977. Predator responses and prey mortality in Redshank, Tringa totanus (L.) and a preferred prey, Corophium volutator (Pallas). ____ J. Anim. Ecol. 46, 21-35.

GOSS-CUSTARD, J.D., 1977. Responses of Redshank, Tringa totanus (L.) to the absolute and relative density of two prey species. ____ J. Anim. Ecol. 46, 867-974 (The prey species are the polychaet, Nereis diversicolor, and Corophium volutator).

GOSS-CUSTARD, J.D., D.G. KAY & R.M. BLINDELL, 1977. The density of migratory and overwintering Redshank, Tringa totanus, and Curlew, Numenius arquata, in relation to the density of their prey in South East England. ____ Est. coast. mar. Sci. 5, 497-510.

GRIFFITHS, C.L., 1977. Deep-sea amphipods from West of Cape Point, South Africa. ____ Ann. S. Afr. Mus. 73, 93-104 (Deals with Lepechinella sucia, Bathyphotis tridentata, Euonyx scutatus n. sp., Lepedepecroides nubifer, Epimeria concordia n. sp., and Caprella ungulina, the latter a symbiont of the giant stone crab, Neolithoides).

GRIFFITHS, C., 1977. The South African Museum's Meiring Naude cruises. 6. Amphipoda. ____ Ann. S. Afr. Mus. 74, 105-123. (With i.a. 2 new monotypic genera of Lysianassidae, Izinkala fihla and Valettiella costellana, and illustrations of Dikwa acrania, Lepechinella occlo, Dautzenbergia grandimanus, Urothoides inops, Bathyamaryllis conocephala, and Parametopa grandimana ♂).

GRIFFITHS, D., 1977. Caloric variation in Crustacea and other animals. ____ J. Anim. Ecol. 46, 593-605.

GRIGORJEV, B.F. & V.A. PUNKOV, 1977. (Benthic invertebrates of the Yagorlytskiiy and Tendrovskiy bays of the Black Sea). ____ Vestn. Zool. 2, 76-82 (In Russian, not seen).

HARRISON, P.G., 1977. Decomposition of macrophyte detritus in sea-water; effects of grazing by amphipods. ____ Oikos 28, 165-169.

HAUKSSON, E., 1977. (Distribution and habitat of marine littoral invertebrates in Breidafjördur, W. Iceland). ____ Natturu frae fingurinn 47, 88-98 (In Icelandic, with English summary).

HAZEN, T.C. & G.W. ESCH; 1977. Studies on the population biology of two larval trematodes in the amphipod, Hyalella azteca ____ Am. Midl. Natur. 98, 213-219. (Not seen).

HOLLAND, A.F. & J.M. DEAN, 1977. The community biology of intertidal macrofauna sandbars in the North Inlet area of South Carolina, USA. ____ Pp 423-438 in B.C. COULL (ed.) Ecology of marine benthos 6. Belle W. Baruch Libr. mar. Sci., Columbia, S. Carolina.

HOLLAND, A.F., N.K. MOUNTFORD & J.A. MINURSKY, 1977. Temporal variation in Upper Bay mesohaline benthic communities. 1. The 9 m mud habitat. ____ Chesapeake Sci. 18, 370-378.

HOLLAND, A.F. & T.T. POLGAR, 1976. Seasonal changes in the structure of an intertidal community. ____ Mar. Biol. 37, 341-348 (This is a community dominated by Acanthohaustorius millsi and Pseudohaustorius caroliniensis).

HOLSINGER, J.R., 1977. Some observations on the taxonomy of the Cuban subterranean amphipod genus Weckelia (Gammaridae). ____Res. Exped. biospeleol. Cubano-Roumanes Cuba 2, 267-269 (Weckelia (Neoweckelia cubanica is a junior synonym of W. caeca).

HOLSINGER, J.R., 1978. Systematics of the subterranean amphipod genus Stygobromus (Crangonyctidae), part 2. Species of the eastern United States - Smithson. Contr. Zool. 226, 1-144. (30 new species are described and the synonymy of Stygobromus, Stygonectes and Apocrangoyx reaffirmed. Stygobromus now has no less than 93 species).

INMAN, C.B.E. & A.P.M. LOCKWOOD, 1977. Some effects of methylmercury and lindane on sodium regulation in the amphipod Gammarus duebeni during changes in the salinity of its medium. ____Comp. Biochem. Physiol. 58 C, 67-75 (Not seen)

JENSEN, K., 1978. (Amphipods: Illustrated keys to the Danish amphipods). ____BIOKON, Copenhagen, 39 pp (More will be said about this most original key in A.N. 11, as my copy has not yet arrived).

JUNERA, H., C. ZERBIB, M. MARTIN & J-J. MEUSY, 1977. Evidence for control of vitellogenin synthesis by an ovarian hormone in Orchestia gammarella (Pallas), Crustacea: Amphipoda. ____ Gen. comp. Endocrinol. 31, 457-462.

JUST, J., 1977. A new genus and species of corophiid Amphipoda from pteropod shells of the bathyal western Atlantic, with notes on related genera (Crustacea). ____ Steenstrupia 4, 131-138 (Pterunciola spinipes gen. et. sp. nov., living in empty shells of the pteropod, Cuvierina columnella).

KAMENSKAJA, O.E., 1977. (Two new species of ultraabyssal amphipods from Yap Trench). ____Trud. Inst. Okeanol. 108, 105-115. (In Russian, with English summary. Princaxelia magna n. sp. and Lepechinella vitrea n. sp.)

KAMIHIRA, Y., ? (Ecological studies on macrofauna on sandy beach of Hakodate, Japan 1. On the sampling technique to estimate the population density and the biomass of an amphipod). ____ ? (In Japanese, with English summary. Unfortunately I can't read the name of the journal).

KANDYUK, R.P. & L.D. KAMINSKAYA, 1977. (Studies on the sterols in some crustaceans from the Black Sea) ____Zh. Evol. Biokhim. Fiziol. 13, 434-438 (In Russian, not seen Deals i.a. with several amphipod spp.).

KARAMAN, G.S., 1977. Contribution to the knowledge of the Amphipoda. 82. New members of the genus Cheirocratus Nor. from Mediterranean Sea, C. monodontus n. sp. (fam. Gammaridae). ____ Glas. Republ. Zavoda Zašt. Prirode-Prirodnjackog Muzeja Titograd 10, 59-68.

KARAMAN, G.S., 1977. The value of genus Neogammarus (Ruffo 1937) and its relation to the genus Echinogammarus Stebb. 1889 (fam. Gammaridae) (Contribution to the knowledge of the Amphipoda 88). ____ Animalia 4, 109-121 (Not seen)

KARAMAN, G.S. & S. RUFFO, 1977. On some interesting Echinogammarus species from the Mediterranean basin with description of a new species, E. catacumbae n. sp. (Amphipoda, Gammaridae).

KHALAF, G. & H. TACKET, 1977. La dynamique de colonisation des substrats artificiels par les macroinvertebrés d'un coursd'eau. ____ Annls. Limnol. 13, 169-190.

KUZMIN, E.V. & M.A. BOBOVICH, 1977. (Osmoregulation in some amphipods). ____ Gidrobiol. Zh. 13 (4), 67-70 (In Russian, not seen).

LAGARDÈRE, J-P., 1977. Recherches sur la distribution verticale et sur l'alimentation des Crustacés Décapodes benthiques de la pente continentale du Golfe de Gascogne. Analyse des groupements carcinologiques. ____ Bull. Cent. Etud. Rech. sci. Biarritz 11, 367-440. (An important, but easily overlooked paper. On p. 381 the vertical distribution of 77 amphipod species in the area is tabulated, while many data on the presence of amphipods in fish stomachs are also given).

LAUTENSCHLAGER, K.P., N.V. KAUSHIK & J.B. ROBINSON, 1978. The peritrophic membrane and faecal pellets of Gammarus lacustris limnaeus Smith. ____Freshw. Biol. 8, 207-211.

LEDOYER, M., 1977. Contribution à l'étude de l'écologie de la faune vagile profonde de la Méditerranée Nord Occidentale. 1. Les Gammariens (Crustacea, Amphipoda). ____Boll. Mus. Civ. St. Nat. Verona 4, 321-421 (A major paper, with many ecological data. The following species are described and illustrated: Iphimedia jugoslavica, Amphilochoides longimanus, A. pseudolongimanus n. sp., A. serratipes, Amphilochus planierensis n. sp, Gitana longicarpus n. sp., Peltocoxa mediterranea, Leptamphopus massiliensis n. sp., Corophium rotundirostre, Gammaropsis pseudostroumovi n. sp., Lembos angularis,

Rhachotropis caeca n. sp., R. glabra n. sp. R. grimaldii, R. inermis n. sp., R. integricauda, Idunella pirata, Kerguelenia reducta n. sp., Normanian quadrimanus, N. ? sarsi, Orchomene massiliensis n. sp. Podoprion bolivari, Podoprinonella fissicaudata n. sp, Sophrosyne hispana, Tryphosella sp., Pardalisca sp., ? Pardaliscoides tenellus, Pleustidae 2 spp. indet., Dulichia cf. nordlandica, Laetmatophilus armatus, Pseudotiron bouvieri, Syrrhoe affinis, S. angulipes n. sp. and Syrrhoites pusillus)

LEDOYER, M., 1978. Amphipodes gammariens (Crustacea) des biotopes cavitaires organogénes récifaux de l'Ile Maurice (Océan Indien). ____ Mauritius Inst. Bull. 8, 197-332. (An important paper from a little-known region. The following taxa are described: Iphimedia compacta n. sp., ? Panoploea sp., Ampelisca pygmaea, Amphilochella laticarpa n. sp., Amphilochus neapolitanus, Unyapheonoides dabber var. angustipes n. ssp., Amphithoe cavimana, A. pollex var. hirsutus n. ssp., A. ramondi, A. sp., ? Cymadusa brevidactyla, Paradusa mauritiensis n. sp., Anamixis grossimana n. sp., Paranamixis ? bocki, P. excavatus n. sp., Colomastix ? lunalila, C. truncatipes Ledoyer in press (also figs of Med. C. pusilla), ? Aorcho curvipalma n. sp., Gammaropsis abbotti, G. afra, G. atlantica, G. grandimana n. sp. G. holmesi, G. mauritiensis n. sp., G. photissimilis, G. polipoki Lembos pseudopunctatus n. sp., Ritaumius longicornis n. gen. n. sp. (Corophiidea), Paradexamine indentata n. sp., P. micronesica (Ledoyer, in press), Biancolina ? mauihina, Ceinina latipes n. sp. Ceradocus mahafalensis Ledoyer (in press) incisa n. ssp., Elasmopus ecuadorensis hawaiensis, E. malakai pilosus Ledoyer, in press, E. pseudaffinis, Eriopisella dentifera n. sp., Mallacoota subcarinata, Nuuanu amikai, Pseudelasmopus cheliferus n. gen. n. sp. (Gammaridae s. l.), Parajassa chilkoa, P. spinipalma Ledoyer (in press) longicephalus n. ssp., Leucothoe acutilobata n. sp., L. predenticulata n. sp., Liljeborgia proxima, Ensayara angustipes n. sp., ? Paralysianopsis mauritiensis n. sp., Laetmatophilus acuticephalus n. sp., Podocerus of. palinuri, Seba hirsuta n. sp., S. typica and Hyale inermis Ledoyer, in press. Better copies of the figures are available from the author).

LEVINGS, C.D., 1976. River diversion and intertidal benthos at the Squamish river delta, British Columbia. ____Pp 193-202 in S. Skreslet et al. (ed.). Freshwater on the sea. Proc. Symp on the influence of fresh water outflow on biological processes in fjords and coastal waters, 22-25 April. 1974, Geilo, Norway. Ass. norw. Oceanogr., Oslo.

LOUIS, M., 1977. (A study of the populations of Talitridae in the coastal ponds of the Mediterranean. 1. Interpretation of the variations in number within the different phases). ____ Bull. Ecol. 8, 63-74 (In French, not seen).

LOUIS, M., 1977. (idem 2. An identification of their cohorts, cycles, and fecundity). ____Bull. Ecol. 8, 75-86 (In French, not seen)

MACAN, T.T., 1977. 1977. A twenty-year study of the fauna in the vegetation of a moorland fishpond. ____ Arch. Hydrobiol. 81, 1-24. ("Reduction of odonate larvae was followed by a great increase of the numbers of Gammarus")

MacDONALD, A.G. & I GILCHRIST, 1978. Further studies on the pressure tolerance of deep-sea Crustacea, with observations using a new high-pressure trap. ____ Mar. Biol. 45, 9-21. (Describes exp. and obs. on Tmetonyx cicada)

McGRATH, D., 1978. Stenula latipes (Chevreux & Fage)(Crustacea: Amphipoda), associated with the hermit crab Pagurus bernhardus (L.), new to the British fauna. ____ Ir. Nat. J. 19, 196-197.

McKINNEY, L.D. & J.L. BARNARD, 1977. A new marine genus and species of the Nuuanu-group (Crustacea, Amphipoda) from the Yucatan Peninsula. ____ Proc. biol. Soc. Wash. 90, 161-171 (Tabatzius copillius n. gen. n. sp., with notes on Gammarella fucicola. Also Nuuanu and Cottesloe belong to the Nuuanu-group)

MACQUART-MOULIN, C., 1977. Les modifications des réactions photocinétiques des Peracarides de l'hyponeuston nocturne en fonction de la composition spectrale de la lumière. ____ Tethys 7 (1975), 349-356.

MARTIEN, R.F. & A.C. BENKE, 1977. Distribution and production of two crustaceans in a wetland pond. ____ Am. Midl. Nat. 98, 162-175 (As Asellus sp. and Crangonyx gracilis in NW Georgia. Not seen).

MARTIN, D.W., 1977. Survey of the family Caprellidae (Crustacea, Amphipoda) from selected sites along the northern California coast. ____Bull. sthn Calif. Acad. Sci. 76, 146-167 (19 species among which Caprella acanthifera humboldtiensis n. ssp.)

MATTA, J.F., 1977. Beach fauna study of the CERC Field Research Facility, Duck, North Carolina. ____ Misc. Rep. U.S. Army Coast. Eng. Res. Cent. 77-6, 1-102 (Not seen)

MAURER, D., 1977. Estuarine benthic invertebrates of Indian River and Rehoboth bays, Delaware. ____ Int. Rev. ges. Hydrobiol. 62, 591-629 (27 amphipod species listed on p. 600-601)

MAURER, D., L. WATLING, P. KINNER, W. LEATHEM & C. WETHE, 1978. Benthic invertebrate assemblages of Delaware Bay. ____ Mar. Biol. 45, 65-78.

MELVILLE, R.V., 1977. Opinion 1090. Gammarus setosus Dementieva, 1931 (Crustacea, Amphipoda) conserved under the plenary powers. ____ Bull. zool. Nomencl. 34, 46-49. (At the same time, the senior synonym G. spetsbergensis Vosseler is suppressed).

MEUSY, J.J., M.F. BLANCHET & H. JUNÉRA, 1977. (Molt and vitellogenesis in the amphipod crustacean Orchestia gammarella Pallas 2. Study of vitellogenin synthesis ("the female protein fraction" of the hemolymph) after destruction of Y organs.) ____Gen. comp. Endocrinal. 33, 35-40 (In French, not seen).

MEYER-ROCHOW, V.B. 1978. The eyes of mesopelagic crustaceans 2. Streetsia challengeri (Amphipoda) ____ Cell Tissue Res. 186, 337-349.

MICHAEL, A.D. & B. BROWN, 1978. Effects of laboratory procedure on fuel oil toxicity. ____ Environm Poll. 15, 277-287. (Exp. with Neohaustorius schmitzi)

MONK, D.C., 1977. The digestion of cellulose and other dietary components, and pH of the gut in the amphipod Gammarus pulex (L.). ____ Freshw. Biol. 7, 431-441.

MONOD, T., 1976. Expédition Rumphius 2(1975). Crustacés parasites, commensaux etc. 1. Introduction. ____ Bull. Mus. natn. Hist. nat. (3) 391, 833-843.

MOORE, J.W., 1977. Importance of algae in the diet of subarctic populations of Gammarus lacustris and Pontoporeia affinis. ____ Can. J. Zool. 55, 637-641.

MOORE, P.G., 1978. Turbidity and kelp holdfast Amphipoda. 1. Wales and S.W. England. ____ J. exp. mar. Biol. Ecol. 32, 53-96. (A well of information on the biological distribution and even the "shorthand identification" of many amphipod specis)

MORENO, C.A. & H.H. OSORIO, 1977. Bathymetric food habit changes in the antarctic fish, Notothenia gibberifrons Lönnberg (Pisces: Nototheniidae). ____ Hydrobiologia 55, 139-144. (Fish from less than 100 m ate principally amphipods, those from deeper water mostly bivalves).

MOUNTFORD, N.K., A.F. HOLLAND & J.A. MIHURSKY, 1977. Identification and description of macrobenthic communities in the Calvert Cliff region of the Chesapeake Bay. ____Chesapeake Sci. 10, 360-369.

MYERS, A.A., 1977. Studies on the genus Lembos Bate 5. Atlantic species: L, smithi (Holmes), L, brunneomaculatus sp. nov., * L. unifasciatus sp. nov. ____ Boll. Mus. Civ. Stor. Nat. Verona 4, 95-124.

MYERS, A.A., 1977. idem 6. Atlantic species, L. dentischium sp. nov., L. kunkelae sp. nov., L. rectangulatus sp. nov., L. unicornis Bynum & Fox. ____Boll. Mus. Civ. Stor. Nat. Verona 4, 125-154.

MYERS, A.A., 1977. Two new species of the amphipod genus Microdeutopus Costa from the Mediterranean Sea. ____Boll. Mus. Civ. Stor. Nat. Verona 4, 475-478. (M. bifidus n. sp. and M. similis n. sp.)

MYERS, A.C., 1977. Sediment processing in a marine subtidal sandy bottom community 1. Physical aspects 2. Biological consequences. ____ J. mar. Res. 35, 609-632, 633-647.

NEALE, J.W., 1978. A re-investigation of Scott's Pontocypris? hyperborea (Ostracoda) from Franz Joseph land. ____ Crustaceana 34, 69-75 (A senior synonym of Acetabulastoma littorale littorale Schornikow, and obligate associate of gammarids)

NICOTRI, M.E., 1977. The impact of Crustacean herbivores on cultured seaweed populations. ____ Aquaculture 12, 127-136 (i.a. Ampithoe valida. Not seen)

NILSSON, L.M., 1977. Incubation time, growth and mortality of the amphipod Gammarus pulex under laboratory conditions. ____ Oikos 29, 93-98.

* L. minimus sp. nov.

NILSSON, L.M. & P. SJOSTROM, 1977. Colonization of implanted substrates by differently sized Gammarus pulex (Amphipoda). ____ Oikos 28, 43-48.

PINKSTER, S., 1978. Amphipoda ____ Pp. 244-253 in J. ILLIES (ed.) Limnofauna Europaea.

PONOMAREVA, Z.A., 1978. (Heat resistance of some scuds in the Caspian complex of Dniepr and Kaunas Water Reservior). ____ Zool. Zh. 57 610-613. (In Russian. Deals with Pontogammarus crassus, P. robustoides and Chaetogammarus ischnus)

RATEAU, J-G. & C. ZERBIB, 1978. Etude ultrastructurale des follicules ovocytaires chez le Crustacé Amphipode Orchestia gammarellus (Pallas). ____ C.R. Acad. Sci. Paris D 286, 65-68.

ROKOP, F.J., 1977. Patterns of reproduction in the deep-sea benthic crustaceans: A re-evaluation. ____ Deep Sea Res. 24, 683-691 (Studies on 2 isopod spp. and Harpiniopsis excavata give no reason to suspect seasonal peaks of reproduction)

RUFFO, S. & U. SCHIECKE, 1977. (The Mediterranean species of the genus Lepidepecreum Bate & West-wood (Amphipoda, Lysianassidae)). ____ Boll. Mus. Civ. Stor. Nat. Verona 4, 429-447 (In Italian, with German summary Deals with L. longicorne, L. crypticum n. sp. and L. subclypeatum n. sp.)

RUFFO, S. & A. VIGNATAGLIANTI, 1977. (Second contribution to the knowledge of the genus Bogidiella in Mexico and Guatemala (Crustacea, Amphipoda, Gammaridae). ____ Quaderni Accad. Naz. Lincei 171, (3), 125-172. (Five new species: B. orchestipes, B. pasquinii, B. vomeroi, B. niphargoides B. michaelae

SCHIECKE, U., 1977 Zwei neue Vertreter der Cyproideinae (Amphipoda: Amphilochinae) aus dem Mittelmeer: Pseudopeltocoxa gibbosa n. g. n. sp. und Peltocoxa mediterranea n. sp. ____ Boll. Mus. Civ. Stor. Nat. Verona 4, 525-542.

SCHRAM, F.R., 1977. Paleozoography of late Paleozoic and Triassic Malacostraca. ____ Syst. Zool. 26, 367-379.

SEKERAH, A. & M. FOY, 1978. Acute lethal toxicity of Corexit 9527/ Prudhoe Bay crude oil mixtures to selected Arctic invertebrates. ____ Spill Technol. Newsl. 3 (2), 37-41. (Onisimus littoralis, Boeckosimus edwardsi, Anonyx nugax and a copepod)

SHELDON, A.L., 1977. Colonization curves: application to stream insects on semi-natural substrates. ____ Oikos 28, 256-261. (Does not deal with amphipods, but results applicable to amphipod studies).

SHYAMASUNDARI, K., 1977. Cytochemical studies on the neurosecretory cells of Talorchestia martensii (Weber) and Orchestia platensis Kröyer (Crustacea, Amphipoda). ____ Cell. molecul. Biol. 22, 79-86.

SHYAMASUNDARI, K. K. HANUMANTHA RAO, 1977. Studies on the alimentary canal of amphipods: morhpology and histology of cephalic mucous glands. ____ Crustaceana 33, 149-152, Pls. 1-2 (Studies on Orchestia platensis and Talorchestia martensii)

SKULT, P., 1977. Composition of phytal macrofauna communities on transects extending seawards from Helsinki. _____ Mem. Soc. Fauna Flora fenn. 53, 43-56.

SMITH, D.G., 1977. The genus Crangonyx (Amphipoda; Gammaridae) in the central Connecticut River system. ____Can. Field- Nat. 91, 256-261. (Not seen)

STOCK, J.H., 1977. The zoogeography of the crustacean suborder Ingolfiellidea with description of new West Indian taxa. ____ Stud. Fauna Curacao 55, 131-146 (New taxa: Ingolfiella (Gevgeliella) fontinalis and I. (G.) tubularis)

STOCK, J.H., 1977. The taxonomy and zoogeography of the Hadziid Amphipoda with emphasis on the West Indian taxa. ____ Stud. Fauna Curacao 55, 1-130 (An important study dealing with the following taxa: Hadzia fragilis, Metahadzia n. gen. with its type species Hadzia tavaresi Mateus & Mateus, Metaniphargus curasavicus with the new ssp. M. c. orientalis, M. nicholsoni, M. palpator n. sp., M. bousfieldi n. sp. M. longipes n. sp. (with M. l. christophorensis n. ssp.), M. beattyi, M. jamaicae (Holsinger), Alloweckelia gurneei, Saliweckelia n. gen. with its type species S. emarginata, and S. holsingeri n. sp.)

STOCK, J.H., 1978. Bogidiella martini, un nouvel Amphipode souterrain de l'Isle Saint-Martin (Antilles) et la zoogéographie des Bogidiellidae. ____ Int. J. Speleol. 9, 103-113.

TASHIRO, J.E., 1978. Comparison of Eupronoe armata Claus, 1879, and Eupronoe intermedia Stebbing, 1888 (Amphipoda, Hyperiidae). ____ Crustaceana 34, 76-82 (Both are valid species)

THURSTON, M.H., 1977. Depth distribution of Hyperia spinigera Bovallius, 1889 (Crustacea: Amphipoda) and medusae in North Atlantic Ocean, with notes on the associations between Hyperia and coelenterates. ____ Pp 499-536 in M. ANGEL (ed). A voyage of Discovery, George Deacon 70th anniversity volume. Pergamon Press. Oxford (U.K.) (Many data on biology. H. antarctica is synonymized with H. spinigera

TRANTER, H.A., 1977. Further studies of plankton ecosystems in the eastern Indian Ocean. 7. Ecology of the Amphipoda. ____ Austr. J. mar. Freshw. Res. 28, 645-662. (Sixty-four spp. of Hyperiidea along a N-S section (9-32°S, 110°E) over a period of a year).

TURQUIN, M.-J., 1976. Choix d'un traceur biologique dans un système karstique jurassien. ____ Annls scient. Univ. Besanco 25, 423-429 (Not seen)

TZVETKOVA, N.L., 1977. (Some peculiarities of ecology, growth and production of two species of gammarids (Amphipoda, Gammaridae) in high latitudes of the Arctic). _____ Explor. Fauna Seas SSSR 14 (22), 291-298. (In Russian, with English summary. Data on growth and production on populations of Gammarus setosus and G. wilkitzkii from northern Novaya Zemlya and Franz Josef Land, collected by SCUBA diving)

VOSHELL, J.R. & G.M. SIMMONS, 1977. An evaluation of artificial substrates for sampling macrobenthos in reservoirs. ____Hydrobiologia 53, 257-270

WAKABARA, Y. & F.P. PEREIRA LEITE, 1977. Heterophlias seclusus Shoemaker, 1933 (Amphipoda, Phliantidae) from the Brazilian coast. _____ Crustaceana 33, 90-96.

WARD, J.V., 1977. First records of subterranean amphipods from Colorado with descriptions of three new species of Stygobromus (Crangonyctidae). ____ Trans. Am. micr Soc. 96, 452-466. (S. coloradensis n. sp., S. holsingeri n. sp. and S. pennaki n. sp.)

WIEMERS, W., 1978. Die Invertebratenfauna der Fliesszgewässer in Salinger Raum. ____ Decheniana 131, 172-182.

WILLIAMS, J.A., 1978. The annual patterns of reproduction of Talitrus saltator (Crustacea: Amphipoda: Talitridae). ____ J. Zool., Lond. 231-244.

WITHERS, R.G. & C.U. THORP, 1978. The macrobenthos inhabiting sandbanks in Langstone Harbour, Hampshire. ____ J. nat. Hist. 12, 445-455.

ZEIDLER, W., 1978. Hyperiidea (Crustacea: Amphipoda) from Queensland water. ____ Austr. J. Zool., Suppl. Ser. 59, 1-93 (35 spp., some new to science, but 22 new to the Great Barrier Reef region and 16 new to Australia. All are diagnosed and illustrated. Keys to, and a checklist of Australian Hyperiidea are also provided)

ZIMMERMAN, R.J. & J.L. BARNARD, 1977. A new genus of primitive marine hadziid (Amphipoda) from Bimini and Puerto Rico. ____ Proc. biol. Soc. Wash. 89, 565-580 (Protohadzia n. gen., based on Eriopisa schoenerae Fox. E. longiramus and E. coeca are removed to Psammogammarus, E. hamakua to Dulzura, and E. laakona to Hadzia)

Last minute additions

BOWMAN, Th.E., 1978. Revision of pelagic amphipod genus Primno (Hyperiidea: Phrosinidae). _____ Smithson. Contr. Zool. 275, 1-23 (Four spp. of which P. brevidens and P. johnsoni are described as new)

MAREN, M.J. van, 1977. Note on the occurrence of Acanthocephala larvae in Gammaridean Amphipoda from the river Slack (France, Dept. Pas-deCalais). ____ Bull. zool. Mus Univ. A'dam 6, 45-48.

SHEADER, M., 1978. Distribution and reproductive biology of Corophium insidiosum (Amphipoda) on the north-east coast of England. ____ J. mar. biol. Ass. U.K. 58, 585-596.

SKALSKI, A.W., 1978. (Niphargus tatrensis Wrzesniowski, 1888 (Amphipoda) in the Krakow-Czestochowa upland). ____ Przeglad zool. 22, 40 (In Polish, with English summary).

Last second additions

BARNARD, J.L., 1977. A new species of Synchelidium (Crustacea, Amphipoda) from sand beaches in California. ____Proc. biol. Soc. Wash. 90, 877-883 (S. micropleon n. sp. is the species which Enright used many years ago for his well-known experiments on tidal rhythms).

GAMO, S., 1977. A new gammaridean Amphipoda, Melita sexstachya sp. nov. from Sagami Bay. ____Proc. Jap. Soc. Syst. Zool. 13, 65-71 (Not seen)

HEARD, R.W. & D.G. PERLMUTTER, 1977. Description of Colomastix janicese n. sp. a commensal amphipod (Gammaridea: Colomastigidae) from the Florida keys, U.S.A. ____Proc. biol. Soc. Wash. 90, 30-42

KARAMAN, G.S., 1977. Contribution to the knowledge of the Amphipoda. 81. Revision of the genus Carinurus Sov. 1915 from Baikal Lake (fam. Gammaridae). ____Poljoprivrede i Sumarstro 13, 33-52 (Bazikelova's forms A-C of C. reissneri are given specific rank and described as C. amentatus, C. bifrons and C. bazikolovae n. spp. A key to the 11 recognized species is provided).

KUDRJASHOV, V.A. & A. Yu. ZVAGINTSEV, 1975 ? (Amphipods Crustaceans: composition and distribution to the fouling of natural substrates in the tidal zone of the Tauysk Gulf, the Okhotsk Sea). ____Pp 137-166 in Fouling on the Japan and Ikhosk Seas. Trans. Inst. mar. Biol. Vladivostok 3. (In Russian. Deals with 32 intertidal amphipod ssp. their ecological distribution and their zoogeographical position).

LEWIS, M.M., 1976. Amphipoda, ____Pp 167-182 in A. CHAPMAN & M. LEWIS. An introduction to the freshwater Crustacea of New Zealand. Collins, Auckland & London: 26 pp. (13 spp. dealt with)

ORTIZ, M., 1976. (A new amphipod from Cuban waters). ____ Invert. mar. ciene. (8) 25, 21-35 (Heterophlias seticoxa sp. n.).

ORTIZ, M., 1976. (A new genus and new species of amphipodes from Cuban waters (Amphipoda, Gammaridea, Ampithoidae). ____ Invert. mar. ciene. (8) 27, 3-12 (Pseudeamphithoides bacescui n. gen. n. sp. In. Spanish)

ORTIZ, M. 1976. (A new amphipod (Amphipoda, Gammaridea, Gammaridae), collected from the stomach content of the Yellow Grant Haemulon sciurus, in Cuban waters. ____Invert. mar. cienc (8) 27, 13-20 (In Spanish, Nuuanu muelleri, n. sp.)

ORTIZ, M., 1976. (A new species of wood-boring amphipod (Amphipoda, Gammaridea, Cheluridea) from Cuba. ____ Invert. mar. cienc. (8) 27, 21-26 (In Spanish. Tropichelura gomezi n. sp.)

New subscribers

Dr. Dan Danielopol. Linmologiaches Inst., Univ. of Wien. A-1090 Wien, Osterreich

Dr. Masanori Hiroki, Kyoto Univ. of Education, Fujinomori, Fushimi-yu Kyoto, Japan.

Dr. Russ Kimble, 205 Harvard CT, College Station, TX 77840, U.S.A.

Dr. Patsy A. McLaughlan (♀). Dept. of Biological Sciences. Florida International University, Tamiami Trail, Miami, FLA 33199, U.S.A.

Dr. James G. Wilkins, 13632 Goodwood Dr., Baton Rouge, LA 70815, U.S.A.